

# **Summary Report For The 2004 Breeding Season Avian Point Count Survey At The Long Island Complex, Mississippi River Pool 21**

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## **ABSTRACT**

During the 2003 and 2004 breeding seasons, a point count survey project was conducted in Pool 21 of the Upper Mississippi River, Adams County, Illinois. The study area was the Long Island Complex (river miles 332.5 to 340.5), which included Long, Shandrew, and Flannigan Islands, along with associated sloughs, backwaters, and side channels. This study area included approximately 4,084 acres, which was primarily comprised of mature floodplain bottomland forest, except for approximately 681 acres that were active agricultural fields until the early to mid 1990's, after which agriculture was abandoned. Since then, this acreage has been undergoing ecological succession and is now comprised of old-field and early successional floodplain forest. Additionally, approximately 180 of these acres are part of a HREP project, including a 67-acre tree planting. Furthermore, this study area included several associated sloughs, wetlands, and backwaters. During the 2004 project, we established 51 point count locations along seven transects. One transect (12 survey points) was located in the old field/early successional forest habitat on the west side of Long Island. Five transects (36 survey points) were established within the mature floodplain forest habitat. One additional transect (3 survey points), which was not utilized in 2003, was located in the HREP tree planting site on the east side of Long Island. Each point was sampled two times during the breeding season (early June through early July). Ten-minute unlimited radius point counts were conducted, resulting in 102 sampled points. Additionally, "species of interest" identified between points (i.e. interpoint data) were also recorded. A cumulative total of 100 species were identified over the two-year study period: 87 species in 2003 and 92 species in 2004. Of the diversity reported in 2004, 87 species were recorded at one or more points, while 59 species were encountered at interpoints. The 92 species consisted of 17 Permanent Residents, 33 North American Migrants, and 42 Neotropical Migrants. Overall, 5,403 individual birds were identified at points, with an additional 445 tallied at interpoints. Among data from the point locations, the 10 most abundant species included: Great Blue Heron, Common Grackle, Indigo Bunting, Northern Cardinal, Black-capped Chickadee, American Crow, Red-winged Blackbird, Great Crested Flycatcher, Eastern Wood-Pewee, and Chimney Swift. These species also had the highest relative densities. The 11 most frequently encountered species were similar, except the Brown-headed Cowbird, Red-headed Woodpecker, and American Robin replaced the Great Blue Heron and Red-winged Blackbird. The 10 most widely distributed species included: Northern Cardinal, Indigo Bunting, Common Grackle, Eastern Wood-Pewee, Black-capped Chickadee, Brown-headed Cowbird, Chimney Swift, American Crow, Great Crested Flycatcher, and American Robin. This project provides preliminary baseline data regarding breeding season avian use of the mature and early successional forest habitats that are found within the Long Island Complex study area.

## **INTRODUCTION**

During the past several decades, there has been steadily growing concern regarding the declining populations of many avian species across North America, especially among the long distance or Neotropical Migrants and short distance or North American Migrants. (Robbins et al. 1989; Askins et al. 1990; Finch 1991; Robinson et al. 1995; Sherry and Holmes 1995). Long-term monitoring programs such as the Breeding Bird Survey (Peterjohn et al. 1995; Price et al. 1995) and the Christmas Bird Count (Root 1988) have documented the general trend of declining avian populations. Research has also begun to document the decline of many avian species during migration periods (Cox 1985; Askins et al. 1990; Moore et al. 1990; Moore and Simons 1992; Moore et al. 1993; Ewert and Hamas 1996). Additionally, considerable research has illustrated the plight of many decreasing avian populations throughout all major habitat types in the Midwest Region (Donovan et al. 1996; Herkert et al. 1996; Howe et al. 1996; Johnson 1996; Knutson et al. 1996; Koford and Best 1996; Robinson 1996; Thompson et al. 1996).

The causes of these overall declines in avian numbers are not well understood, primarily since standardized long-term avian monitoring and research is still in its relatively early stages of development (McKay et al. 1999). Nevertheless, a considerable amount of research appears to be demonstrating two key components involved with avian population declines throughout North America, but particularly in the East and Midwest (Droege and Sauer 1990), to be habitat loss and habitat fragmentation (Galli et al. 1976; Whitcomb et al. 1981; Lynch and Whigham 1984; Temple and Cary 1988; Terborgh 1989; Wilcove and Robinson 1990; Robinson et al. 1995). Furthermore, these two factors seem to be impacting avian populations in the breeding range (Freemark and Collins 1992; Robinson et al. 1995), wintering range (Petit et al. 1993; Faaborg et al. 1996), as well as the migrational range (Thompson et al. 1993; Moore et al. 1995).

Habitat loss and fragmentation appear to have particularly negative effects on forest interior birds, as well as those species requiring larger “patches” of habitat (Whitcomb et al. 1981; Lynch and Whigham 1984; Robbins et al. 1989; Peterjohn and Sauer 1994; Robinson et al. 1995). Evidence exists suggesting that these habitat interior and area-sensitive species experience substantially higher rates of both nest predation and brood parasitism (i.e. Brown-headed Cowbird) when nesting in fragmented forest patches, which include proportionally larger amounts of edge habitat (Gates and Gysel 1978; Brittingham and Temple 1983; Wilcove 1985; Small and Hunter 1988; Paton 1994). As a consequence, there is a direct link between habitat fragmentation and decreased reproductive success among many avian species (Whitcomb et al. 1981; Lynch and Whigham 1984; Robbins et al. 1989).

Within the Upper Midwest, floodplain forests and forested wetlands along the Mississippi River and its major tributaries provide some of the largest tracts of forested habitat remaining in the region (Grettenberger 1991). Although much of the Mississippi River floodplain has been leveed, drained, and cleared for agriculture, urban uses, and other human activities, a relatively large portion of forest and wetland habitat remains in public ownership (Grettenberger 1991; Treiterer 1996). This land, largely part of the Upper Mississippi River National Wildlife and Fish Refuge and Mark Twain National Wildlife Refuge Complex, is not greatly threatened by land use activities that result in large-scale habitat loss. Nevertheless, various activities such as logging, forest regeneration practices, road and pipeline construction, recreational facility

development, and levees for fish and wildlife management projects continue to cause fragmentation of these habitat tracts (Grettenberger 1991; Treiterer 1996).

Furthermore, changes in the natural hydrologic patterns, which have resulted from increased human activity and development, along with impoundment of the Upper Mississippi River, threatens to substantially alter the relatively large tracts of remaining forest and wetland habitats (Yin and Nelson 1996). For example, comparisons between Upper Mississippi River floodplain forests of the past and present reveal a substantial decrease in tree species diversity (i.e. oak, hickory, pecan, elm, willow, and cottonwood), along with a significant increase in the flood-tolerant Silver Maple (*Acer saccharinum*) (Yin and Nelson 1996). This lack of diversity and poor tree regeneration can be attributed to flat topography, higher groundwater levels caused by impoundment, increased frequency and duration of inundation, reduced creation of new islands and shoreline and subsequent plant succession, and increased competition from reed canary grass and other herbaceous vegetation (River Resources Forum 2004). These factors all affect forest diversity and regeneration (River Resources Forum 2004). Furthermore, erosion by waves, ice, and river currents has long term effects on the number and acreage of islands, which may lead to island loss and dissection, further reducing habitat quality (River Resources Forum 2004). Consequently, the proportion of mature, later successional forest has been greatly reduced (Yin and Nelson 1996).

Unfortunately, limited information is available regarding avian use and importance of these floodplain forests to Midwestern bird populations (Treiterer 1996). Consequently, the impacts of fragmenting these forests to Midwestern avian species are also not well understood or even researched (Grettenberger 1991). Emlen et al. (1986) documented a diverse avian community within these bottomland forests, including the presence of many species which were uncommon or absent in the adjacent uplands. Inman et al. (2002) also recognized that riparian forests were found to support disproportionately large numbers of breeding bird species as compared to more xeric forests and other upland habitats. Nevertheless, basic information such as avian population densities and composition along the Mississippi River has only been investigated to a limited extent. Additionally, the habitat requirements of many bottomland forest bird species have not been well described and are largely unknown (Samson 1979). Without these important pieces of information, it will be impossible to develop effective management strategies for floodplain bottomland forest birds (Grettenberger 1991). As a result, this project was initiated with the following objectives.

## **OBJECTIVES**

- 1) To document breeding season avian diversity within the Long Island Complex study area.
- 2) To record the relative abundance of each species identified within the study area during the breeding season.

- 3) To determine the frequency of occurrence of each species recorded during the study.
- 4) To estimate the relative density of each species encountered during the breeding season.
- 5) To document the breeding season distribution of species occurring within the Long Island Complex study area.
- 6) To preliminarily examine avian use of various successional stages of forest within the floodplain of the Upper Mississippi River.
- 7) To make a cursory comparison between the 2003 and 2004 breeding season avian communities.
- 8) To provide a basis for the establishment of long-term avian monitoring within the floodplain of the Upper Mississippi River.

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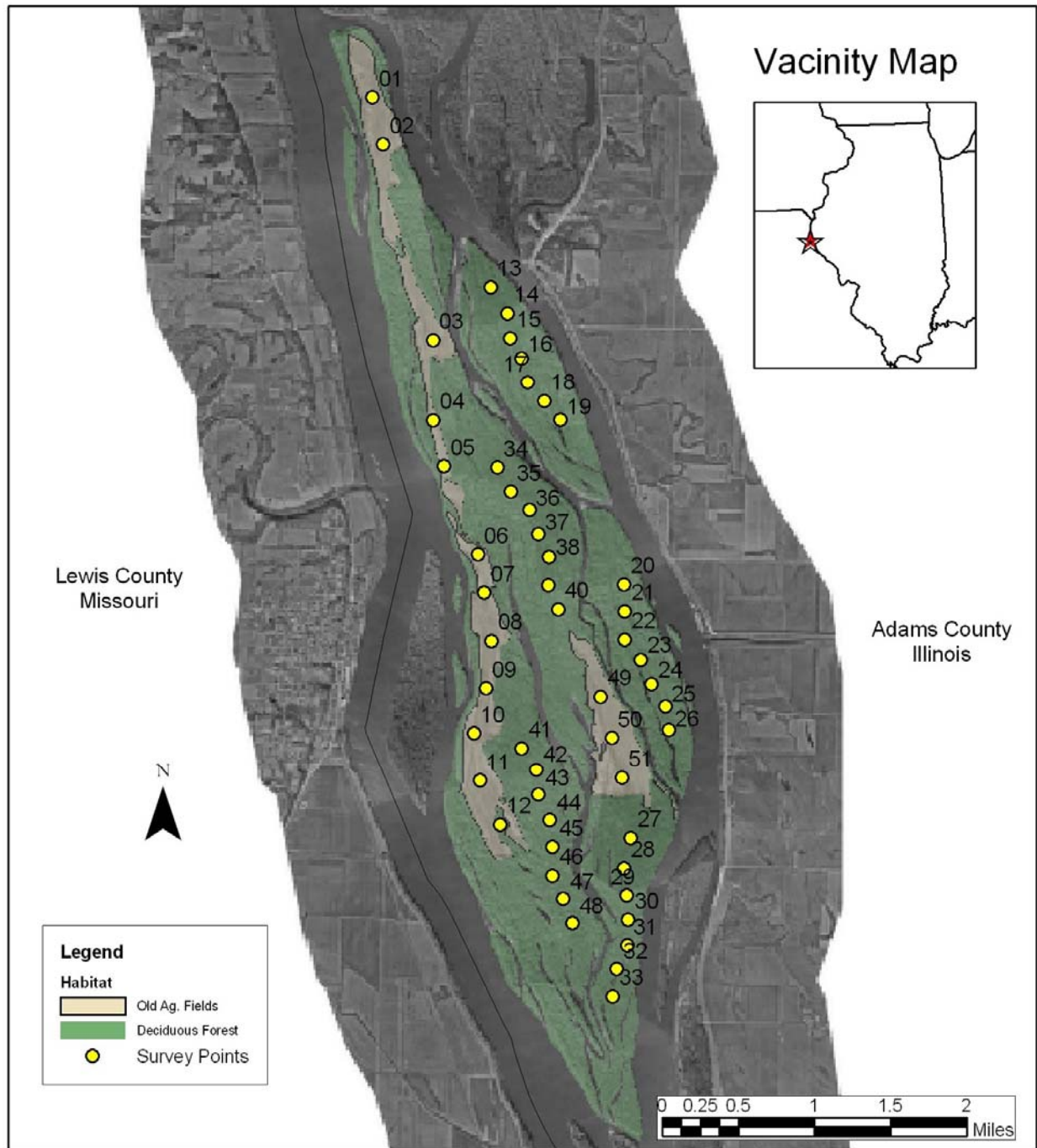
## **STUDY AREA**

The study area for this project was the Long Island Complex, located along the Illinois side of the Mississippi River (river miles 332.5 to 340.5), just north of Quincy, Illinois (Figure 1). This area represents the Long Island Division of the Great River National Wildlife Refuge.

**Figure 1. Long Island Complex study area during the 2004 breeding season avian survey project.**



Figure 2. Avian point count locations during the 2004 Long Island Complex bird survey.



The Long Island Complex study area includes Long, Shandrew, and Flannigan Islands, along with associated wetlands, sloughs, backwaters, and side channels. As a result, this study area includes approximately 4,084 acres, which is composed largely of mature floodplain bottomland forest. However, approximately 681 acres were active agricultural fields until the early to mid 1990's, when agriculture was abandoned. This acreage has since been undergoing ecological succession, and is now composed of old-field and early successional floodplain forest. Within this 681 acres of early successional habitat, approximately 180 acres consists of a HREP project. Included here, was a 67-acre tree planting which occurred over three consecutive fall seasons (2001-2003). Species planted included: Northern Pecan (*Carya illinoensis*), American Sycamore (*Platanus occidentalis*), Swamp White Oak (*Quercus bicolor*), Bur Oak (*Quercus macrocarpa*), and Pin Oak (*Quercus palustris*). The remaining 113 acres consists of old field and naturally regenerating floodplain forest. In addition to the forested habitat, this study area includes a diversity of associated wetlands, sloughs, backwaters, and side channels.

The topography of this area ranges from 475 to 485 feet above msl. Although the hardwood forest community (i.e. oak, hickory, and walnut) has been greatly reduced from presettlement abundance, this site still maintains some of the largest, most mature, as well as diverse floodplain forest habitat within the Midwest (Birkenholz 1992; Treiterer 1996). The dominant tree species in the lower, wetter sites include Silver Maple and Eastern Cottonwood (*Populus deltoides*). In addition to the previous two species, the slightly higher, drier areas are also characterized by Green Ash (*Fraxinus pennsylvanicus*), American Elm (*Ulmus americana*), American Sycamore, Northern Pecan, Bur Oak, Pin Oak, Shellbark Hickory (*Carya laciniata*), Honey Locust (*Gleditsia tricanthos*), and Kentucky Coffeetree (*Gymnocladus dioica*) (Birkenholz 1992; Treiterer 1996).

Throughout most of the study area, ground cover and understory vegetation was dominated by Wood Nettle (*Laportea canadensis*) and Poison Ivy (*Toxicodendron radicans*) (Birkenholz 1992; Treiterer 1996). However, the old agricultural fields and smaller woodland openings were characterized by an abundance of Giant Ragweed (*Ambrosia trifida*) and Bur Cucumber (*Echinocystis lobata*) (Treiterer 1996). Other species characteristic of the ground cover and understory included: Clearweed (*Pilea pumila*), Spotted Touch-Me-Not (*Impatiens biflora*), Moonseed (*Menispermum canadense*), Trumpet Creeper (*Campsis radicans*), Common Elderberry (*Sambucus canadensis*), Tartarian Honeysuckle (*Lonicera tartarica*), grape (*Vitis* spp.), and grasses which were mostly Woodlane Brome (*Bromus* spp.) and Wild Rye (*Elymus* spp.) (Birkenholz 1992; Treiterer 1996).

During the course of this project, 51 avian survey point count locations were established along seven individual transect routes within the Long Island Complex study area (Figure 2; Appendix A). Photographic documentation of each point count location is provided in Appendix B. Additionally, specific vegetative characteristics present at each point count location is available in Appendix C. Following, is a general vegetative habitat description of each of the seven transect routes.

Transect 1: Points 1-12 (Long Island – Old Field) - These represent the 12 points which sampled the old field and early successional forest habitat within the study area (Figure 2). These 12 points were placed in the two old fields located along the west side of Long Island. The fields comprised 511 total acres and were extremely linear (approximately 8.8 kilometers long and approximately 400 meters wide at the widest point). The two fields were actively cropped until 1995. In 1996, 300 acres were planted with trees (i.e. bare root seedlings, direct seeding with

acorns, and containerized stock). Most of the trees planted in the south field did not survive. Currently, this field is dominated by herbaceous growth with patch areas of dense saplings and pole sized trees. The north field had marginal tree survival, particularly on the west side and north end. However, natural seeding is providing a considerable amount of tree regeneration in this field. Vegetative information was collected at each of the survey points including use of a standard forest inventory prism plot for canopy information along with four 1/300<sup>th</sup> acre fixed radius plots 30 feet from plot center in cardinal directions for subcanopy data. Seven of the 12 points were dominated by very dense sapling growth, 20 to 35 feet in height and mostly canopied. Data from fixed radius sapling plots at these points provides estimates of sapling density that range from 1,000 to over 16,000 stems per acre with 4,300 as an average. The principal species included silver maple, eastern cottonwood, and willow (*Salix* spp.). The remaining 5 points were dominated by herbaceous vegetation. The characteristic species at these points included giant ragweed, wood nettle, stinging nettle (*Urtica dioica*), various amaranth species (*Amaranthus* spp.), trumpet creeper, several smartweed species (*Polygonum* spp.), grape spp., and various species of grasses. Only scattered trees were present at these points.

Transect 2: Points 13-19 (Shandrew Island) - This island is approximately 3.2 kilometers long and up to 0.8 kilometers wide. It is east and separated from Long Island by a slough 100 meters wide (Figure 2). Shandrew Island is immediately north of Flannigan Island. This, and the remaining four transects, are predominantly forested. Although the forested habitat throughout this study area consists of typical floodplain bottomland species, which tend to be flood tolerant (i.e. silver maple, eastern cottonwood, and green ash), the 1993 flood did significantly impact the forest habitat throughout the region (Yin and Nelson 1996). Tree mortality associated with the 1993 flood resulted in considerable forest canopy openings within the study area. However, the canopy coverage was still visibly estimated at 60% for the majority of points. The overall canopy coverage for this transect averaged 64%. The canopy height averaged roughly 100 feet. Plot data showed that silver maple dominated the canopy and averaged 24 inches in diameter at 4.5 feet off the ground. The other one-third of the canopy consisted of (by order of abundance): American elm, green ash, northern pecan, and other species. Dead standing trees averaged 20 inches in diameter and averaged 4 per acre. Saplings up to 10 to 20 feet tall dominated the subcanopy on four of the seven points according to plot data. These saplings, which were closely associated with the canopy openings, included (in order of abundance): green ash, silver maple, American elm, hackberry, Kentucky coffeetree, American sycamore, boxelder (*Acer negundo*), and other species. Estimates of sapling density ranged from 900 to 8800 stems per acre with an average of 2900 stems per acre. The ground cover was dominated by wood nettle, poison ivy, and giant ragweed.

Transect 3: Points 20-26 (Flannigan Island) - This island is approximately 3.2 kilometers long and up to 0.6 kilometers wide. It is east and separated from Long Island by a slough 60 meters wide (Figure 2). Flannigan Island is also dominated by typical flood tolerant trees. Silver maple, which averaged 18 inches in diameter, accounted for over half of the canopy according to plot data. The other species included (in order of abundance): eastern cottonwood, green ash, and American elm. Anecdotal observations between points indicated the forest canopy on Flannigan Island was substantially more intact than Shandrew Island though the recorded canopy closure average of 68 percent was only slightly higher. The canopy height averaged 110 feet. Dead standing trees were prevalent and averaged 15 inches in diameter with an average density

of 14 per acre. Additionally, a sapling layer dominated the subcanopy at four of the points and averaged up to 10 to 15 feet in height. The majority of the saplings recorded were green ash and American elm along a smaller proportion of hackberry, silver maple, and other species. The sapling density recorded at the plots ranged from 225 to 4350 trees per acre with 2700 as an average. Within this transect, the ground cover was dominated by wood nettle and poison ivy.

Transect 4: Points 27-33 (Long Island – Southeast) - This transect is located on the lower southeast end of Long Island (Figure 2). The transect was placed through the center of an area delineated by the eastern old field to the north, Long Island Chute to the east, and Long Island Lake to the west. This transect contained the most intact overstory canopy within the study area. This transect had the highest average canopy closure at 77 percent and the highest average basal area at 170 square feet per acre. Though there were canopy gaps, they were significantly less numerous than at the other transects. Silver maple accounted for nearly two-thirds of the canopy and averaged 19 inches in diameter. Green ash made up most of the remaining canopy which also included some sparse northern pecan. The canopy averaged 110 feet in height. This transect had the least amount of dead standing trees averaging only 2 per acre. The southeast transect also had the least pronounced sapling layer in the subcanopy. This patchier sapling layer averaged up to 10 to 15 feet in height and was dominated by silver maple and American elm. Sapling density ranged from 150 to 2475 stems per acre and with 1350 as an average. The ground cover was dominated by silver maple seedlings, wood nettle, bur cucumber, poison ivy, and other species.

Transect 5: Points 34-40 (Long Island – Northeast) - This transect occurred near the middle of Long Island across from the lower end of Shandrew and upper end of Flannigan Islands (Figure 2). It was located approximately in the middle of an area bordered by the Shandrew and Flannigan Island sloughs to the east, Long Island Lake and the western old fields to the west, and the eastern old field to the south. This transect possessed greater forest diversity than either the Shandrew or Flannigan Island transects. In addition to the typical Silver maple (averaging 23 inches in diameter) and Green ash component which accounted for half of the canopy at the plots, the overstory along this transect had a significant component of bur oak, pin oak, and shellbark hickory. The canopy was tall like the other forested transects and averaged 111 feet in height. A substantial number of canopy openings occurred along this transect, presumably resulting from the 1993 flood. Dead standing trees averaged 17 inches in diameter with a density of 7 per acre. The canopy closure estimates averaged the lowest of any of the forested transects at 53 percent. Even so, heavy herbaceous competition has kept the sapling layer from dominating most of the plot locations. The woody subcanopy layer was the dominant understory on only two plots and but more diverse than the previous transects. This moderately dense layer which averaged up to 10 to 15 feet in height was dominated by Green ash and Silver maple but had a significant component of Kentucky Coffeetree and Hackberry (*Celtis occidentalis*). Sapling density ranged from 450 to 5100 stems per acre with 1900 as an average. The herbaceous ground layer was dominated by Giant Ragweed, Wood Nettle, and Poison Ivy.

Transect 6: Points 41-48 (Long Island – Southcentral) - This transect was located on Long Island west of Long Island Lake and east of the southern portion of the western old fields (Figure 2). The forest along this transect proved to be among the most diverse, supporting species like shellbark hickory and bur oak at many of the points. However, silver maple, averaging 19 inches

in diameter, accounted for nearly half of the overstory component. The canopy averaged 100 feet in height. This transect also contained a significant number of canopy openings and averaged just 54 percent canopy closure which was slightly denser than the previous transect. In conjunction with the canopy openings, dead standing trees were found at a density of 8 per acre and averaged 17 inches in diameter. The canopy openings also allowed for a dense sapling layer in the subcanopy dominated by green ash with an additional component of silver maple, American elm, and other species. Sapling density ranged from 1050 to 6600 stems per acre with 3000 as an average. The sapling layer ranged from 6 to 20 feet in height. The remaining ground cover was also diverse, consisting of various species of dense grasses, wood nettle, bur cucumber, grape spp., poison ivy, and many other species.

Transect 7: Points 49-51 (Long Island- HREP Field) - The three points comprising transect 7 were placed into a 180 acre field on the southeast portion of Long Island, west of the lower end of Flannigan Island, and north of Transect 4. Until this century, the area has been farmed since federal acquisition. But by the late nineties the area was only occasionally providing a viable crop for the agricultural lessee. The USFWS designated the area for reforestation through tree planting and natural regeneration. The tree planting was included in a Habitat Rehabilitation and Enhancement Project managed through the US Army Corps of Engineers Environmental Management Program. A total of sixty-seven were planted over a three year period beginning in fall 2001. Two gallon containerized stock of American sycamore, pin oak, swamp white oak, bur oak, and northern pecan were planted at 50 trees per acre. Dredged material from the slough between the site and Flannigan Island was incorporated into the tree planting area prior to planting. The material was from the backwater fish overwintering portion of the project and intended to aid in tree survival. Red top grass (*Agrostis alba*) was planted between rows with marginal success. Outside of the tree planting area, only a small portion of the west side of the field was being invaded by willow spp., eastern cottonwood, and other flood tolerant species. During the surveys, the flood dominated over the features of the site. The surveys were taken from a boat during both time periods with as much as 5 feet of water over the site. Only the highest portion of the field, the eastern edge emerged from the flood waters during the second time period. Apart from flooded conditions, anecdotal observations indicate the dominant cover over the entire area is giant ragweed, stinging nettle, several smartweed species, and other annual vegetation.

## **METHODS**

During this project, the breeding season avian community within the Long Island Complex study area was documented using point count methodology. Point counts have proven to be an extremely efficient and effective method for estimating avian species richness and relative abundance (Reynolds et al. 1980; Bibby et al. 1992; Ralph et al. 1993; Ralph et al. 1995). This is particularly useful for projects designed to monitor avian population trends

(Verner 1985; Hutto et al. 1986; Ralph et al. 1993; Petit et al. 1995). Additionally, point counts are repeatable which permits these trends to be monitored over time (Verner 1985). Because our emphasis was to provide a baseline documentation of the avian community utilizing the study area during the breeding season, we used unlimited-radius point count techniques. This allowed all birds identified at a point to be recorded, regardless of distance. Points using an unlimited radius have greater mean detections resulting in greater power to detect population changes (Thompson et al. 2002). Furthermore, “species of interest” detected between points (i.e. interpoint data) were also opportunistically recorded. Consequently, a greater proportion of the overall avian community within the study area was recorded. However, since interpoint data was collected in a non-standardized and non-repeatable fashion, it was treated as a supplement to the point count data (Bibby et al. 1992). As a result, point and interpoint data were separated during analysis. Although this represents one of the most widely used methods for avian monitoring (Blondel et al. 1981; Ralph et al. 1993), unlimited-radius point counts do not permit absolute population densities or species – habitat relationships to be determined (Petit et al. 1995). Therefore, during our analysis, we only examined relative densities. Species – habitat relationships were not assessed.

Prior to the initiation of surveys, 51 point count sampling locations were established along seven transects. One transect (12 survey points) was located in the western old field/early successional forest habitat. Five transects (36 survey points) were established within the mature floodplain forest habitat. One additional transect (3 survey points), which was not utilized in 2003, was located in the eastern HREP field. Each point was permanently marked with a Trimble Geoexplorer 3 GPS unit (Figure 2; Appendix A), as well as a Garmin 12 GPS unit. Additionally, each point count location was also marked with fluorescent pink flagging tape, in order to more easily relocate points during the project. All sampling points were placed at least 150 meters from the habitat edge (Birkenholz 1992; Treiterer 1996). To prevent duplication of data between points, those in the mature forest were placed a minimum of 250 meters apart, while those in the more open early successional habitat were separated by at least 500 meters (Ralph et al. 1993), except points 6 and 7 which were 400 meters apart. During the project, each point was sampled twice between early June and early July (102 total points of data). All points were sampled once during the first half of June through late June, and again during the latter half of June through the first week of July. Surveys were not conducted during periods of steady precipitation or on days with a sustained wind in excess of 15 mph (Ralph et al. 1993). All points were sampled in a five-hour period between sunrise and 10:30 AM (i.e. between 0530 and 1030 hours CDT), during the peak period of avian activity and singing (Ralph et al. 1993).

Throughout the project, each point was sampled for ten minutes. This has proven to be the most efficient survey duration when working in difficult terrain or exceptionally avian-rich habitat (Ralph et al. 1993; Buskirk and McDonald 1995; Lynch 1995; Ralph et al. 1995; Smith et al. 1995; Robinson and McKay 2001). All point count data collected were recorded in the 0-3, 3-5, 5-6, 6-8, and 8-10 minute subsamples. However, analysis based on these subsamples was beyond the scope of this project. Consequently, data were analyzed for the cumulative 10-minute survey. Since unlimited-radius point counts were utilized, all birds identified by sight or sound, including fly-overs, were recorded into a tape recorder. Additionally, “species of interest” observed between points (i.e. interpoint data) were also recorded. Eventually, all data were transcribed from cassette tape to survey data sheets (Appendix F). On each data sheet, species were recorded using a four-letter species code (Appendix D). A complete list of all

species identified during this project can be found in Appendix D (American Ornithologists' Union 2003).

Each species was assigned to one of three migratory classes (Appendix D) (Bonney et al. 1995; National Geographic Society 2002). Avian species in which the majority of the population is non-migratory are classified as Permanent Residents (RES). Those which migrate from breeding grounds to a wintering range in North America are referred to as North American Migrants (NAM). Those species in which the majority of the population breeds in North America and winters in the Caribbean, Central, or South America are classified as Neotropical Migrants (NTM). During this project, the total number of birds recorded represented the number of individuals detected rather than the actual number of birds present. This is a sampling artifact resulting from surveying the same points repeatedly. As a consequence, various numbers of the same individuals may have been recorded during both sample periods. For this reason, we regarded the total number of individuals tallied for each species as a measure of relative abundance rather than an actual abundance or density estimate. Due to the non-standardized, non-repeatable nature of interpoint data, it was treated separately from point count data. During analysis, we examined five parameters of the breeding season avian community. First, we documented overall species richness as the diversity of species recorded throughout the project. Second, we determined the relative abundance for each species as the total number of individuals recorded. Third, we examined the frequency of occurrence for each species as the percentage of points at which each species was encountered. Fourth, we determined the relative density for each species as the number of individuals recorded per point. Fifth, we documented the overall distribution for each species in terms of which points the species occurred (Appendix E).

## **RESULTS**

During the 2004 breeding season, two survey periods were conducted at the Long Island Complex. As a result, a total of 102 points of data were collected (17.0 hours of total sampling effort). The first and second sampling period required 8 and 7 days to complete, respectively. The first survey period was conducted on 2-3, 7, 9, 11-12, and 23-24 June, while the second period occurred on 24-25, 29-30 June and 1-2, 7 July.

Over the two-year sampling period, 100 species were recorded: 87 in 2003 and 92 in 2004. Eight species were encountered in 2003 that were not documented in 2004. These include the Northern Bobwhite (*Colinus virginianus*), American Coot (*Fulica americana*), American Woodcock (*Scolopax minor*), Olive-sided Flycatcher (*Contopus cooperi*), Alder Flycatcher (*Empidonax alnorum*), Kentucky Warbler (*Oporornis formosus*), Summer Tanager (*Piranga rubra*), and Chipping Sparrow (*Spizella passerina*) (Table 1). Conversely, 13 species were recorded in 2004 that were not documented in 2003. These include the American White Pelican (*Pelecanus erythrorhynchos*), Cattle Egret (*Bubulcus ibis*), Mississippi Kite (*Ictinia mississippiensis*), Bald Eagle (*Haliaeetus leucocephalus*), Red-shouldered Hawk (*Buteo*

Table 1. Species richness, relative abundance, frequency of occurrence, and relative density of the avian community present at the Long Island Complex during the 2003 and 2004 breeding season.

Species *,**	Mig. Class ***	# Indiv. Pts. >		# Ind. Interpts ^		# Indiv. Total		% Change Ind. From Pts. 2003 ^^	# Pts. (%) >>		# Ind. / Pt. >>>	
		2003	2004	2003	2004	2003	2004		2003	2004	2003	2004
CAGO	NAM	3	44	19	28	22	72	+93	3 (3)	8 (8)	0.03	0.43
WODU	NAM	46	41	121	35	167	76	-11	18 (19)	20 (20)	0.48	0.40
MALL	NAM	2	7	0	3	2	10	+71?	1 (1)	3 (3)	0.02	0.07
HOME	NAM	0	1	3	3	3	4	+100?	0 (0)	1 (1)	0.00	0.01
WITU	RES	1	0	1	2	2	2	-100?	1 (1)	0 (0)	0.01	0.00
NOBO	RES	1	0	1	0	2	0	-100?	1 (1)	0 (0)	0.01	0.00
AWPE	NAM	0	0	0	32	0	32	0	0 (0)	0 (0)	0.00	0.00
DCCO	NAM	0	0	1	9	1	9	0	0 (0)	0 (0)	0.00	0.00
GBHE	NAM	138	371	70	43	208	414	+63	40 (42)	43 (42)	1.44	3.64
CAEG	NAM	0	0	0	2	0	2	0	0 (0)	0 (0)	0.00	0.00
GRHE	NAM	1	1	0	2	1	3	0?	1 (1)	1 (1)	0.01	0.01
BNHE	NAM	1	1	1	0	2	1	0?	1 (1)	1 (1)	0.01	0.01
TUVU	NAM	8	23	10	5	18	28	+65?	5 (5)	13 (13)	0.08	0.23
MIKI	NTM	0	5	0	10	0	15	+100?	0 (0)	2 (2)	0.00	0.05
BAEA	NAM	0	2	0	4	0	6	+100?	0 (0)	2 (2)	0.00	0.02
COHA	NAM	3	3	0	0	3	3	0?	2 (2)	3 (3)	0.03	0.03
RSHA	NAM	0	1	0	0	0	1	+100?	0 (0)	1 (1)	0.00	0.01
RTHA	NAM	4	17	1	5	5	22	+76?	3 (3)	11 (11)	0.04	0.17
AMCO	NAM	0	0	1	0	1	0	0	0 (0)	0 (0)	0.00	0.00
KILL	NAM	1	5	13	0	14	5	+80?	1 (1)	2 (2)	0.01	0.05
SPSA	NTM	0	1	0	1	0	2	+100?	0 (0)	1 (1)	0.00	0.01
AMWO	NAM	0	0	1	0	1	0	0	0 (0)	0 (0)	0.00	0.00
ROPI	RES	0	1	0	0	0	1	+100?	0 (0)	1 (1)	0.00	0.01
MODO	NAM	36	27	0	0	36	27	-25	20 (21)	18 (18)	0.38	0.26
BBCU	NTM	0	7	0	1	0	8	+100?	0 (0)	6 (6)	0.00	0.07
YBCU	NTM	66	68	12	4	78	72	+3	40 (42)	50 (49)	0.69	0.67
GHOW	RES	4	5	0	1	4	6	+20?	3 (3)	4 (4)	0.04	0.05
BAOW	RES	13	7	3	3	16	10	-46?	10 (10)	7 (7)	0.14	0.07

Table 1. Continued.

Species *,**	Mig. Class ***	# Indiv. Pts. >		# Ind. Interpts ^		# Indiv. Total		% Change Ind. From Pts. 2003 ^^	# Pts. (%) >>		# Ind. / Pt. >>>	
		2003	2004	2003	2004	2003	2004		2003	2004	2003	2004
CHSW	NTM	143	178	0	1	143	179	+20	55 (57)	65 (64)	1.49	1.75
RTHU	NTM	23	31	0	2	23	33	+26	21 (22)	25 (25)	0.24	0.30
BEKI	NAM	1	4	1	1	2	5	+75?	1 (1)	4 (4)	0.01	0.04
RHWO	NAM	142	131	3	5	145	136	-8	63 (66)	66 (65)	1.48	1.28
RBWO	RES	236	106	0	0	236	106	-55	80 (83)	62 (61)	2.46	1.04
DOWO	RES	73	116	3	5	76	121	+37	47 (49)	60 (59)	0.76	1.14
HAWO	RES	39	39	2	3	41	42	0	29 (30)	26 (25)	0.41	0.38
NOFL	NAM	20	47	2	2	22	49	+57	16 (17)	29 (28)	0.21	0.46
PIWO	RES	91	59	10	6	101	65	-35	54 (56)	42 (41)	0.95	0.58
QSFL	NTM	0	0	1	0	1	0	0	0 (0)	0 (0)	0.00	0.00
EWPE	NTM	221	183	4	1	225	184	-17	76 (79)	83 (81)	2.30	1.79
ACFL	NTM	38	34	18	5	56	39	-11	26 (27)	23 (23)	0.40	0.33
ALFL	NTM	7	0	0	0	7	0	-100?	5 (5)	0 (0)	0.07	0.00
WIFL	NTM	0	1	0	0	0	1	+100?	0 (0)	1 (1)	0.00	0.01
LEFL	NTM	2	1	0	0	2	1	-50?	2 (2)	1 (1)	0.02	0.01
EAPH	NAM	2	3	0	0	2	3	+33?	1 (1)	3 (3)	0.02	0.03
GCFL	NTM	280	194	12	2	292	196	-31	81 (84)	82 (80)	2.92	1.90
EAKI	NTM	1	3	2	0	3	3	+67?	1 (1)	2 (2)	0.01	0.03
WEVI	NTM	1	3	1	1	2	4	+67?	1 (1)	3 (3)	0.01	0.03
BEVI	NTM	4	1	0	0	4	1	-75?	2 (2)	1 (1)	0.04	0.01
YTVI	NTM	61	55	6	1	67	56	-10	38 (40)	37 (36)	0.64	0.54
WAVI	NTM	83	54	6	5	89	59	-35	36 (38)	23 (23)	0.86	0.53
REVI	NTM	145	129	7	0	152	129	-11	64 (67)	64 (63)	1.51	1.26
BLJA	RES	75	107	6	0	81	107	+30	41 (43)	53 (52)	0.78	1.05
AMCR	RES	167	206	0	0	167	206	+19	64 (67)	72 (71)	1.74	2.02
FICR	RES	2	12	3	4	5	16	+83?	2 (2)	9 (9)	0.02	0.12
PUMA	NTM	1	7	0	0	1	7	+86?	1 (1)	5 (5)	0.01	0.07
TRSW	NAM	16	43	1	62	17	105	+63	10 (10)	25 (25)	0.17	0.42
NRSW	NTM	10	15	9	75	19	90	+33?	8 (8)	8 (8)	0.10	0.15

Table 1. Continued.

Species *,**	Mig. Class ***	# Indiv. Pts. >		# Ind. Interpts ^		# Indiv. Total		% Change Ind. From Pts. 2003 ^^	# Pts. (%) >>		# Ind. / Pt. >>>	
		2003	2004	2003	2004	2003	2004		2003	2004	2003	2004
BKSW	NTM	0	4	0	0	0	4	+100?	0 (0)	3 (3)	0.00	0.04
CLSW	NTM	1	1	0	0	1	1	0?	1 (1)	1 (1)	0.01	0.01
BASW	NTM	7	1	0	1	7	2	-14?	4 (4)	1 (1)	0.07	0.01
BCCH	RES	<u>169</u>	<u>210</u>	4	1	173	211	+20	<u>65 (68)</u>	<u>68 (67)</u>	<u>1.76</u>	<u>2.06</u>
TUTI	RES	73	88	1	2	74	90	+17	44 (46)	48 (47)	0.76	0.86
WBNU	RES	98	114	0	1	98	115	+14	51 (53)	59 (58)	1.02	1.12
BRCR	NAM	6	12	0	1	6	13	+50?	4 (4)	12 (12)	0.06	0.12
CAWR	RES	83	93	5	4	88	97	+11	54 (56)	54 (53)	0.86	0.91
HOWR	NTM	111	124	5	1	116	125	+10	45 (47)	60 (59)	1.16	1.22
BGGN	NTM	110	107	7	1	117	108	-3	48 (50)	53 (52)	1.15	1.05
EABL	NAM	1	1	0	1	1	2	0?	1 (1)	1 (1)	0.01	0.01
WOTH	NTM	33	33	4	4	37	37	0	19 (20)	19 (19)	0.34	0.32
AMRO	NAM	<u>195</u>	<u>157</u>	0	0	195	157	-19	<u>59 (61)</u>	<u>65 (64)</u>	<u>2.03</u>	<u>1.54</u>
GRCA	NTM	46	47	3	0	49	47	+2	19 (20)	21 (21)	0.48	0.46
BRTH	NAM	4	1	1	0	5	1	-75?	3 (3)	1 (1)	0.04	0.01
EUST	RES	31	21	9	0	40	21	-32	7 (7)	11 (11)	0.32	0.21
CEWA	NAM	59	31	0	0	59	31	-47	19 (20)	16 (16)	0.61	0.30
NOPA	NTM	31	39	21	3	52	42	+21	21 (22)	29 (28)	0.32	0.38
YEWA	NTM	32	25	0	0	32	25	-22	17 (18)	17 (17)	0.33	0.25
CSWA	NTM	1	0	0	1	1	1	-100?	1 (1)	0 (0)	0.01	0.00
YTWA	NTM	31	38	10	7	41	45	+18	22 (23)	31 (30)	0.32	0.37
BPWA	NTM	0	1	0	0	0	1	+100?	0 (0)	1 (1)	0.00	0.01
CRWA	NTM	14	13	3	3	17	16	-7?	12 (13)	11 (11)	0.15	0.13
BWWA	NTM	0	1	0	1	0	2	+100?	0 (0)	1 (1)	0.00	0.01
AMRE	NTM	125	120	8	6	133	126	-4	50 (52)	49 (48)	1.30	1.18
PRWA	NTM	122	120	18	20	140	140	-2	47 (49)	51 (50)	1.27	1.18
KEWA	NTM	2	0	0	0	2	0	-100?	2 (2)	0 (0)	0.02	0.00
COYE	NTM	65	46	1	0	66	46	-29	24 (25)	19 (19)	0.68	0.45
YBCH	NTM	7	13	5	5	12	18	+46?	6 (6)	8 (8)	0.07	0.13

Table 1. Continued.

Species *,**	Mig. Class ***	# Indiv. Pts. >		# Ind. Interpts ^		# Indiv. Total		% Change Ind. From Pts. 2003 ^^	# Pts. (%) >>		# Ind. / Pt. >>>	
		2003	2004	2003	2004	2003	2004		2003	2004	2003	2004
<i>SUTA</i>	NTM	1	0	0	0	1	0	-100?	1 (1)	0 (0)	0.01	0.00
SCTA	NTM	1	4	0	0	1	4	+75?	1 (1)	4 (4)	0.01	0.04
EATO	NAM	3	1	0	0	3	1	-67?	3 (3)	1 (1)	0.03	0.01
<i>CHSP</i>	NTM	3	0	0	0	3	0	-100?	3 (3)	0 (0)	0.03	0.00
SOSP	NAM	33	17	1	0	34	17	-48	19 (20)	9 (9)	0.34	0.17
NOCA	RES	<i>314</i>	<b>272</b>	0	0	314	272	-13	<i>92 (96)</i>	<b>99 (97)</b>	<i>3.27</i>	<b>2.67</b>
RBGR	NTM	28	16	2	1	30	17	-43	18 (19)	12 (12)	0.29	0.16
INBU	NTM	<i>310</i>	<b>303</b>	0	0	310	303	-2	<i>94 (98)</i>	<b>99 (97)</b>	<i>3.23</i>	<b>2.97</b>
DICK	NTM	0	8	0	0	0	8	+100?	0 (0)	3 (3)	0.00	0.08
RWBL	NAM	<i>158</i>	<b>196</b>	7	0	165	196	+19	31 (32)	38 (37)	<i>1.65</i>	<b>1.92</b>
COGR	NAM	<i>315</i>	<b>370</b>	3	1	318	371	+15	<i>68 (71)</i>	<b>80 (78)</b>	<i>3.28</i>	<b>3.63</b>
BHCO	NAM	146	146	0	4	146	150	0	<i>65 (68)</i>	<b>71 (70)</b>	1.52	1.43
BAOR	NTM	83	86	2	1	85	87	+3	45 (47)	51 (50)	0.86	0.84
AMGO	NAM	105	123	2	1	107	124	+15	47 (49)	61 (60)	1.09	1.21

\* Taxonomic order of species (American Ornithologists' Union 2003). Species codes are found in Appendix D.

\*\* "Italicized" and "underlined" species were only found in 2003. "Bolded" species were only found in 2004.

\*\*\* Bonney et al. (1995) and National Geographic Society (2002).

^ Data not used to calculate relative abundance since interpoint data were non-standardized and non-repeatable.

^^ Number of points sampled in 2004 was 6% greater than 2003.

> Relative abundance estimate. "Italicized" and "underlined" represent "top ten" for 2003. "Bolded" represent "top ten" for 2004.

**Table 1. Continued.**

- >> Frequency of occurrence estimate. "Italicized" and "underlined" represent "top ten" for 2003. "Bolded" represent "top ten" for 2004.
- >>> Relative density estimate. "Italicized" and "underlined" represent "top ten" for 2003, "Bolded" represent "top ten" for 2004.
- ? Based on less than 25 individuals sampled at points during both 2003 and 2004.

*lineatus*), Spotted Sandpiper (*Actitis macularius*), Rock Pigeon (*Columba livia*), Black-billed Cuckoo (*Coccyzus erythrophthalmus*), Willow Flycatcher (*Empidonax traillii*), Bank Swallow (*Riparia riparia*), Blackpoll Warbler (*Dendroica striata*), Black-and-White Warbler (*Mniotilta varia*), and Dickcissel (*Spiza americana*) (Table 1).

A cumulative total of 92 avian species were identified in 2004 (Table 1; Appendix D). Of these, 87 species were recorded at point locations while 59 were opportunistically observed within interpoints. Five species were only encountered at interpoints, including the Wild Turkey (*Meleagris gallopavo*), American White Pelican, Double-crested Cormorant (*Phalacrocorax auritus*), Cattle Egret, and Chestnut-sided Warbler (*Dendroica pensylvanica*). Overall, the 92 species consisted of 17 (18%) RES, 33 (36%) NAM, and 42 (46%) NTM. Noteworthy species which were expected, but not observed, within the study area during this project included: Great Egret (*Ardea alba*), Yellow-crowned Night-Heron (*Nyctanassa violacea*), Field Sparrow (*Spizella pusilla*), House Sparrow (*Passer domesticus*), and Eurasian Tree Sparrow (*Passer montanus*).

The 17 hours of cumulative sampling effort yielded 5,403 individual birds identified (Table 1). Of these, 1,456 (27%) were RES, 1,827 (34%) were NAM, and 2,120 (39%) were NTM (Table 1). Consequently, an average of 5.3 birds were tallied during each minute of sample effort and the average number of individuals recorded at each survey point was 53.0. This certainly demonstrates the overall abundance of birds within the study area during the breeding season. Additionally, we also recorded 445 individual birds at interpoints (Table 1). Considering only data from point locations, the 10 most relatively abundant species included: Great Blue Heron (*Ardea herodias*) (371 birds), Common Grackle (*Quiscalus quiscula*) (370 birds), Indigo Bunting (*Passerina cyanea*) (303 birds), Northern Cardinal (*Cardinalis cardinalis*) (272 birds), Black-capped Chickadee (*Poecile atricapilla*) (210 birds), American Crow (*Corvus brachyrhynchos*) (206 birds), Red-winged Blackbird (*Agelaius phoeniceus*) (196 birds), Great Crested Flycatcher (*Myiarchus crinitus*) (194 birds), Eastern Wood-Pewee (*Contopus virens*) (183 birds), and Chimney Swift (*Chaetura pelagica*) (178 birds). Of these, 3 were RES, 3 were NAM, and 4 were NTM. These 10 species accounted for 46% of all the birds recorded at survey points. Other species occurring in noteworthy abundance at points included the Mississippi Kite (5), Black-billed Cuckoo (7), Yellow-billed Cuckoo (*Coccyzus americanus*) (68), Red-headed Woodpecker (*Melanerpes erythrocephalus*) (131), Pileated Woodpecker (*Dryocopus pileatus*) (59), Acadian Flycatcher (*Empidonax virescens*) (34), Yellow-throated Vireo (*Vireo flavifrons*) (55), Red-eyed Vireo (*Vireo olivaceus*) (129), Fish Crow (*Corvus ossifragus*) (12), Carolina Wren (*Thryothorus ludovicianus*) (93), House Wren (*Troglodytes aedon*) (124), Blue-gray Gnatcatcher (*Poliophtila caerulea*) (107), Wood Thrush (*Hylocichla mustelina*) (33), Northern Parula (*Parula americana*) (39), Cerulean Warbler (*Dendroica cerulea*) (13), American Redstart (*Setophaga ruticilla*) (120), Prothonotary Warbler (*Protonotaria citrea*) (120), Yellow-breasted Chat (*Icteria virens*) (13), Dickcissel (8), Brown-headed Cowbird (*Molothrus ater*) (146), and American Goldfinch (*Carduelis tristis*) (123) (Table 1). The abundance of birds among many species demonstrates the importance of the study area to the breeding avian community. Nevertheless, several species occurred in lower than expected numbers. Some of these included: Mallard (*Anas platyrhynchos*), Green Heron (*Butorides virescens*), Turkey Vulture (*Cathartes aura*), Red-shouldered Hawk, Hairy Woodpecker (*Picoides villosus*), Willow Flycatcher, Eastern Kingbird (*Tyrannus tyrannus*), Bank Swallow, Barn Swallow (*Hirundo rustica*), Brown Creeper (*Certhia americana*), European Starling (*Sturnus vulgaris*), Song Sparrow (*Melospiza melodia*), and Rose-breasted Grosbeak (*Pheucticus ludovicianus*) (Table 1). During our surveys, we

encountered several species that are generally associated with upland habitats. This further illustrates the importance of the Long Island Complex for birds. Included with this group were the Bell's Vireo (*Vireo bellii*), Wood Thrush, Brown Thrasher (*Toxostoma rufum*), Chestnut-sided Warbler, Yellow-breasted Chat, Scarlet Tanager (*Piranga olivacea*), Eastern Towhee (*Pipilo erythrophthalmus*), and Dickcissel (Table 1).

During this analysis, we calculated the frequency of occurrence for each species. In other words, how often the species was encountered. This involved determining the total number and percentage of points at which a species was observed (Table 1). Throughout the 2004 breeding season, the 11 most frequently encountered species included: Northern Cardinal (99 points; 97%), Indigo Bunting (99 points; 97%), Eastern Wood-Pewee (83 points; 81%), Great Crested Flycatcher (82 points; 80%), Common Grackle (80 points; 78%), American Crow (72 points; 71%), Brown-headed Cowbird (71 points; 70%), Black-capped Chickadee (68 points; 67%), Red-headed Woodpecker (66 points; 65%), Chimney Swift (65 points; 64%), and American Robin (65 points; 64%). Among these 11 species, 3 were RES, 4 were NAM, and 4 were NTM. In addition to these 11 species, 11 others were recorded on at least 50% of the points. Among these were the Red-bellied Woodpecker (*Melanerpes carolinus*) (61%), Downy Woodpecker (*Picoides pubescens*) (59%), Red-eyed Vireo (63%), Blue Jay (*Cyanocitta cristata*) (52%), White-breasted Nuthatch (*Sitta carolinensis*) (58%), Carolina Wren (53%), House Wren (59%), Blue-gray Gnatcatcher (52%), Prothonotary Warbler (50%), Baltimore Oriole (*Icterus galbula*) (50%), and the American Goldfinch (60%).

Additionally, we examined the relative density that each species occurred in throughout the study area. This parameter was determined as the average number of individuals per point (Table 1). During the course of this project, the 10 species encountered in the greatest density included: Great Blue Heron (3.64 per point), Common Grackle (3.63 per point), Indigo Bunting (2.97 per point), Northern Cardinal (2.67 per point), Black-capped Chickadee (2.06 per point), American Crow (2.02 per point), Red-winged Blackbird (1.92 per point), Great Crested Flycatcher (1.90 per point), Eastern Wood-Pewee (1.79 per point), and Chimney Swift (1.75 per point). These 10 species included 3 RES, 3 NAM, and 4 NTM. Overall, 13 other species had relative densities which exceeded 1.00 per point. These species included: Red-headed Woodpecker, Red-bellied Woodpecker, Downy Woodpecker, Red-eyed Vireo, Blue Jay, White-breasted Nuthatch, House Wren, Blue-gray Gnatcatcher, American Robin, American Redstart, Prothonotary Warbler, Brown-headed Cowbird, and American Goldfinch (Table 1).

We also documented the distribution of each species throughout the Long Island Complex study area. Avian distributions within the early successional habitats (Table 2), as well as the more mature forested habitat (Table 3), are illustrated graphically by the species distribution maps in Appendix E. During the 2004 breeding season, the 10 most widely distributed species included: Northern Cardinal and Indigo Bunting (each recorded at all 51 locations), Common Grackle (48 locations), Eastern Wood-Pewee, Black-capped Chickadee, and Brown-headed Cowbird (all observed at 47 locations), Chimney Swift and American Crow (each recorded at 46 locations), Great Crested Flycatcher (45 locations), and American Robin (43 locations). Of these 10 species, 3 were RES, 3 were NAM, and 4 were NTM. Additionally, 18 species were distributed over 26 or more (i.e. at least half) of the sampling locations (Tables 2 and 3; Appendix E). Again, this suggests the importance of the study area to breeding birds. This group includes the Great Blue Heron, Yellow-billed Cuckoo, Red-headed Woodpecker, Red-bellied Woodpecker, Downy Woodpecker, Pileated Woodpecker, Yellow-throated Vireo, Red-eyed Vireo, Blue Jay, Tufted Titmouse (*Baeolophus bicolor*), White-breasted Nuthatch,

**Table 2. Avian distribution at the 15 early successional points during the 2004 breeding season.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
1	24	GBHE, YBCU, CHSW, RHW, DOWO, WAVI, BLJA, AMCR, BCCH, WOTH, AMRO, GRCA, CEWA, YEWA, AMRE, COYE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
2	22	WODU, CHSW, RBWO, DOWO, NOFL, GCFL, WAVI, AMCR, BCCH, TUTI, HOWR, AMRO, GRCA, COYE, YBCH, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
3	35	GBHE, ROPI, MODO, CHSW, RBWO, DOWO, NOFL, EWPE, EAPH, GCFL, BEVI, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, CAWR, HOWR, WOTH, AMRO, GRCA, EUST, CEWA, NOPA, COYE, YBCH, SOSP, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
4	23	MODO, CHSW, RHW, RBWO, DOWO, EWPE, WAVI, TRSW, BLJA, AMCR, BCCH, TUTI, HOWR, WOTH, AMRO, GRCA, YEWA, AMRE, NOCA, RBGR, INBU, COGR, BAOR
5	29	TUVU, RTHA, YBCU, CHSW, RHW, RBWO, DOWO, NOFL, EWPE, TRSW, NRSW, BLJA, AMCR, BCCH, TUTI, WBNU, WOTH, AMRO, EUST, CEWA, YEWA, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
6	36	GBHE, BAEA, RTHA, MODO, CHSW, RTHU, RHW, RBWO, DOWO, EWPE, GCFL, WAVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, BGGN, WOTH, AMRO, GRCA, EUST, CEWA, YEWA, AMRE, COYE, YBCH, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, AMGO
7	32	WODU, GBHE, KILL, CHSW, RHW, RBWO, DOWO, EWPE, GCFL, WAVI, REVI, BLJA, AMCR, FICR, BCCH, WBNU, HOWR, WOTH, AMRO, GRCA, EUST, YEWA, AMRE, COYE, NOCA, RBGR, INBU, RWBL,

**Table 2. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
8	34	COGR, BHCO, BAOR, AMGO HOME, YBCU, CHSW, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, WEVI, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, HOWR, AMRO, GRCA, EUST, CEWA, YEW, COYE, YBCH, EATO, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
9	25	DOWO, NOFL, PIWO, EWPE, GCFL, WAVI, REVI, AMCR, BCCH, TUTI, WBNU, HOWR, WOTH, AMRO, GRCA, YEW, COYE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
10	28	GBHE, TUVU, RTHA, YBCU, CHSW, RHW, DOWO, HAWO, NOFL, PIWO, BLJA, AMCR, WBNU, AMRO, GRCA, BRTH, YEW, COYE, YBCH, SOSP, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
11	32	TUVU, BAEA, RTHA, MODO, BBCU, CHSW, RHW, DOWO, NOFL, EAPH, GCFL, REVI, PUMA, TRSW, NRSW, BLJA, AMCR, HOWR, WOTH, AMRO, GRCA, CEWA, YEW, COYE, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
12	20	YBCU, CHSW, DOWO, NOFL, EWPE, GCFL, BLJA, AMCR, BCCH, TUTI, HOWR, BGGN, GRCA, AMRE, NOCA, INBU, RWBL, COGR, BAOR, AMGO
49	40	WODU, MALL, GBHE, TUVU, MIKI, COHA, RTHA, KILL, MODO, YBCU, CHSW, RHW, RBWO, NOFL, PIWO, EWPE, GCFL, EAKI, WAVI, TRSW, BKSW, CLSW, BLJA, AMCR, CAWR, AMRO, EUST, YEW, AMRE, COYE, YBCH, SOSP, NOCA, INBU, DICK, RWBL, COGR, BHCO, BAOR, AMGO
50	33	WODU, MALL, GBHE, TUVU, MODO, BBCU, YBCU, BAOW, CHSW, EWPE, WIFL, GCFL, EAKI, WAVI, REVI, TRSW, BLJA, AMCR, FICR, TUTI, AMRO, YEW, COYE, YBCH, SOSP, NOCA, INBU, DICK, RWBL,

**Table 2. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
51	42	COGR, BHCO, BAOR, AMGO CAGO, WODU, MALL, GBHE, GRHE, TUVU, RTHA, BBCU, YBCU, CHSW, RHWO, RBWO, DOWO, NOFL, PIWO, EWPE, EAPH, GCFL, WEVI, TRSW, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, NOPA, YEWA, YTWA, CRWA, AMRE, PRWA, SOSP, NOCA, INBU, DICK, RWBL, COGR, BHCO, BAOR, AMGO

\* Species codes are found in Appendix D.

**Table 3. Avian distribution at the 36 forested points during the 2004 breeding season.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
13	36	GBHE, TUVU, COHA, YBCU, GHOW, CHSW, RHW, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, CEWA, NOPA, YTTA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
14	37	WODU, GBHE, TUVU, MODO, YBCU, CHSW, RHW, RBWO, DOWO, NOFL, PIWO, EWPE, ACFL, GCFL, REVI, BLJA, AMCR, BCCH, WBNU, BRGR, CAWR, HOWR, BGGN, WOTH, AMRO, EUST, NOPA, YTTA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
15	30	GBHE, TUVU, SPSA, MODO, CHSW, RTHU, RHW, RBWO, PIWO, EWPE, GCFL, YTVI, WAVI, REVI, BLJA, BCCH, TUTI, WBNU, CAWR, BGGN, AMRO, EUST, NOPA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR
16	28	CAGO, GBHE, MODO, YBCU, CHSW, RTHU, RHW, DOWO, NOFL, PIWO, EWPE, YTVI, WAVI, REVI, TRSW, AMCR, BCCH, CAWR, HOWR, BGGN, YTTA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR
17	32	GBHE, MODO, YBCU, CHSW, RTHU, RHW, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, AMCR, BCCH, TUTI, WBNU, HOWR, BGGN, CEWA, YTTA, PRWA, SCTA, NOCA, RBGR, INBU, RWBL, COGR, BHCO, BAOR, AMGO
18	36	WODU, GBHE, MODO, YBCU, CHSW, RHW, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, FICK, BCCH, TUTI, WBNU, BRGR, CAWR, HOWR, BGGN, AMRO, NOPA, YTTA, YTTA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
19	36	WODU, GBHE, YBCU, BEKI, RHW, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, GCFL, YTVI, REVI, TRSW, NRSW, BLJA, AMCR,

**Table 3. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
		FICR, BCCH, TUTI, WBNU, BR CR, HOWR, BGGN, AMRO, NOPA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO
20	32	GBHE, YBCU, RHWO, RBWO, DOWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, WAVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, EABL, WOTH, AMRO, GRCA, AMRE, PRWA, NOCA, INBU, BHCO, BAOR, AMGO
21	34	WODU, GBHE, YBCU, BAOW, CHSW, RHWO, RBWO, PIWO, EWPE, GCFL, WAVI, REVI, TRSW, NRSW, AMCR, FICR, BCCH, TUTI, WBNU, CAWR, BGGN, WOTH, AMRO, NOPA, YTTA, AMRE, PRWA, SCTA, NOCA, INBU, RWBL, COGR, BAOR, AMGO
22	38	CAGO, WODU, GBHE, YBCU, CHSW, RBWO, DOWO, HAWO, NOFL, EWPE, ACFL, GCFL, YTVI, REVI, TRSW, NRSW, BLJA, AMCR, BCCH, TUTI, WBNU, BR CR, CAWR, HOWR, BGGN, WOTH, AMRO, CEWA, NOPA, YTTA, PRWA, SCTA, NOCA, INBU, RWBL, COGR, BHCO, BAOR
23	39	WODU, GBHE, BBCU, YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, NRSW, BKSU, BLJA, AMCR, BCCH, TUTI, WBNU, BR CR, CAWR, HOWR, BGGN, AMRO, NOPA, YTTA, CRWA, BWWA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO
24	37	CAGO, WODU, GBHE, BBCU, YBCU, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, EWPE, ACFL, GCFL, WAVI, REVI, TRSW, BLJA, AMCR, FICR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, YTTA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO, BAOR, AMGO

**Table 3. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
25	31	CAGO, WODU, GBHE, YBCU, BEKI, RBWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, AMCR, BCCH, TUTI, WBNU, BRGR, CAWR, HOWR, BGGN, NOPA, YTWA, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
26	36	CAGO, WODU, GBHE, GHOW, CHSW, BEKI, RHW, RBWO, DOWO, NOFL, PIWO, EWPE, ACFL, GCFL, WEVI, REVI, TRSW, BLJA, AMCR, BCCH, TUTI, WBNU, BRGR, CAWR, HOWR, BGGN, AMRO, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
27	31	CHSW, RTHU, BEKI, RHW, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, REVI, TRSW, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
28	32	YBCU, BAOW, CHSW, RTHU, RHW, DOWO, NOFL, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, BRGR, CAWR, HOWR, BGGN, AMRO, YTWA, CRWA, AMRE, PRWA, COYE, NOCA, INBU, RWBL, BHCO, AMGO
29	32	WODU, YBCU, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, NOPA, CRWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR
30	28	GBHE, YBCU, GHOW, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, GCFL, BASW, BLJA, AMCR, BCCH, WBNU, CAWR, HOWR, BGGN, AMRO, PRWA, NOCA, INBU, RWBL, COGR, BHCO
31	35	GBHE, YBCU, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, GCFL, YTVI, REVI, TRSW, BKS, W,

**Table 3. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
		BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, NOPA, YTTA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
32	31	WODU, GBHE, MODO, YBCU, CHSW, RHOW, RBWO, DOWO, PIWO, EWPE, GCFL, YTVI, REVI, TRSW, BLJA, AMCR, BCCH, WBNU, BRGR, CAWR, HOWR, BGGN, AMRO, NOPA, YTTA, PRWA, NOCA, INBU, COGR, BHCO, AMGO
33	32	GBHE, BNHE, YBCU, BAOW, CHSW, RTHU, RHOW, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, TRSW, AMCR, FICR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
34	27	YBCU, CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, NOFL, PIWO, EWPE, ACFL, GCFL, REVI, BLJA, AMCR, BCCH, WBNU, HOWR, BGGN, AMRO, NOPA, YTTA, AMRE, NOCA, INBU, COGR, AMGO
35	28	BBCU, CHSW, RTHU, RHWO, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, WBNU, BRGR, CAWR, HOWR, BGGN, AMRO, NOPA, YTTA, BPWA, CRWA, AMRE, NOCA, INBU, COGR, BHCO, AMGO
36	30	CHSW, RTHU, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI, PUMA, TRSW, AMCR, BCCH, WBNU, BRGR, CAWR, HOWR, BGGN, NOPA, YTTA, CRWA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
37	29	WODU, GBHE, TUVU, YBCU, CHSW, RHOW, RBWO, HAWO, EWPE, GCFL, REVI, TRSW, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, YTTA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, AMGO
38	29	YBCU, CHSW, RHWO, RBWO, DOWO, EWPE, ACFL, LEFL, GCFL, REVI, BLJA,

**Table 3. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
		AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, WOTH, AMRO, NOPA, YTWA, AMRE, PRWA, NOCA, INBU, BHCO, BAOR, AMGO
39	37	GBHE, TUVU, RSHA, RTHA, MODO, YBCU, BAOW, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, TRSW, BLJA, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, CEWA, NOPA, YTWA, AMRE, NOCA, INBU, COGR, BHCO, BAOR
40	33	GBHE, TUVU, MIKI, RTHA, MODO, YBCU, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, EWPE, ACFL, YTVI, REVI, TRSW, BCCH, WBNU, CAWR, HOWR, WOTH, AMRO, EUST, CEWA, CRWA, AMRE, NOCA, INBU, COGR, BHCO, BAOR, AMGO
41	26	CAGO, YBCU, BAOW, CHSW, RTHU, RBWO, DOWO, HAWO, EWPE, GCFL, REVI, PUMA, BLJA, AMCR, BCCH, TUTI, WBNU, WOTH, AMRO, EUST, PRWA, NOCA, INBU, COGR, BHCO, AMGO
42	30	MODO, YBCU, GHOW, CHSW, RTHU, RHW, RBWO, DOWO, HAWO, EWPE, ACFL, GCFL, REVI, BLJA, BCCH, TUTI, WBNU, HOWR, WOTH, AMRO, CEWA, NOPA, YEWA, AMRE, PRWA, NOCA, INBU, RWBL, COGR, BHCO
43	28	YBCU, CHSW, RHW, RBWO, DOWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, WOTH, AMRO, NOPA, AMRE, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
44	28	CHSW, RTHU, RHW, RBWO, DOWO, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, PUMA, BLJA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, AMRO, NOPA, YTWA, AMRE, NOCA, INBU, COGR, BHCO, AMGO
45	29	TUVU, YBCU, CHSW, RHW, RBWO, HAWO, PIWO, EWPE, ACFL, GCFL, YTVI,

**Table 3. Continued.**

<b>Point #</b>	<b>Total # Species</b>	<b>Species Present*</b>
		AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, NOPA, CRWA, PRWA, SCTA, NOCA, INBU, COGR, BHCO, BAOR, AMGO
46	26	WODU, YBCU, CHSW, RHWO, RBWO, DOWO, PIWO, EWPE, GCFL, REVI, PUMA, AMCR, BCCH, TUTI, WBNU, CAWR, HOWR, BGGN, AMRO, CRWA, PRWA, NOCA, INBU, COGR, BHCO, AMGO
47	29	GBHE, RTHA, YBCU, CHSW, RHWO, RBWO, DOWO, HAWO, PIWO, EWPE, GCFL, YTVI, REVI, BLJA, AMCR, FICR, BCCH, WBNU, CAWR, HOWR, BGGN, AMRO, CEWA, PRWA, NOCA, INBU, COGR, BHCO, BAOR
48	32	WODU, GBHE, COHA, YBCU, BAOW, CHSW, RTHU, RHWO, RBWO, NOFL, PIWO, EWPE, ACFL, GCFL, YTVI, REVI, TRSW, NRSW, BLJA, AMCR, BCCH, CAWR, HOWR, BGGN, YTWA, PRWA, NOCA, INBU, COGR, BHCO, BAOR, AMGO

\* Species codes are found in Appendix D.

Carolina Wren, House Wren, Blue-gray Gnatcatcher, American Redstart, Prothonotary Warbler, Baltimore Oriole, and American Goldfinch. Overall, 16 species were only encountered in the early successional habitats (points 1-12 and 49-51), while 14 species were only recorded at forested locations (points 13-48) (Tables 2 and 3; Appendix E).

## **DISCUSSION**

Although the floodplain forests of the Upper Mississippi River and its tributaries provide some of the largest contiguous tracts of forest habitat remaining in the Midwest Region (Grettenberger 1991), these forests are predominantly linear and highly fragmented by side channels, sloughs, and backwaters (Knutson et al. 1996). Nevertheless, these “naturally” fragmented forests appear to function as larger units of contiguous forest habitat, more so than upland forests which have been highly fragmented by human activity throughout the Midwest (i.e. residential, commercial, industrial, and agricultural development) (Blake and Karr 1987; Temple and Cary 1988; Droege and Sauer 1990; Freemark and Collins 1992; Faaborg et al. 1993; Robinson et al. 1995; Robinson 1996). Furthermore, Knutson et al. (1996) found that these linear and fragmented floodplain forests were not negatively impacted in terms of avian diversity and relative abundance.

The limited research conducted within these relatively large tracts of floodplain forest has demonstrated their importance to a diverse and abundant avian community (Emlen et al. 1986; Grettenberger 1991; Mossman 1991; Birkenholz 1992; Schumacher 1993; Best et al. 1995; Knutson 1995; McKay et al. 1995; Knutson et al. 1996; Treiterer 1996; Robinson and McKay 2001). In fact, Best et al. (1995) and Knutson et al. (1996) found greater avian diversity and relative abundance in floodplain forests as compared to upland forests. The floodplain of the Upper Mississippi River provides forest, wetland, and aquatic habitats, but has very little scrub/shrub or grassland habitat (Bellrose 1976; Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Knutson et al. 1996). Nevertheless, the Upper Mississippi River floodplain supports an impressive avifaunal diversity during migrational seasons as well as the breeding season (Emlen et al. 1986; Grettenberger 1991; Mossman 1991; Schumacher 1993; Knutson 1995; McKay et al. 1995; Knutson and Klaas 1997; Robinson and McKay 2001).

Previous avian surveys at the Long Island Complex study area documented a diverse breeding season avian community. Birkenholz (1992) identified 76 species in 22 hours of sampling effort, while Treiterer (1996) recorded 55 and 60 species in 1994 and 1995, respectively. Treiterer (1996) logged in a minimum of 40 hours of observation effort each year reporting 38% RES, 23% NAM, and 39% NTM species. Birkenholz (1992) did not separate species by migratory class. By comparison, during the 2004 breeding season, we recorded a total of 92 species in 17 hours of sampling effort. NAM and NTM species composed a larger proportion of the 2004 avian community (36% and 46%, respectively), while only 18% were RES. Typically, RES species are not of high management concern, whereas several NAM and

NTM species are (Robbins et al. 1989; Askins et al. 1990; Finch 1991; Robinson et al. 1995; Sherry and Holmes 1995). Consequently, in fewer hours of observation effort, we recorded 16 species more than Birkenholz (1992) and 37-32 species more than Treiterer (1996). Additionally, a substantially larger portion of the 2004 avian community consisted of species of higher management concern. When comparing the results from our two-year study (2003 and 2004), similar community richness and overall relative abundance of individuals were observed (McKay and Stravers 2003). For instance, we only identified 5 more species and 234 additional birds in 2004 as compared to 2003 (McKay and Stravers 2003). However, we tallied one extra hour of observation effort during the latter year, which may account for the slight increase in species richness and relative abundance. Furthermore, the 2003 and 2004 avian communities were composed of nearly identical proportions of each migratory class (McKay and Stravers 2003). It is interesting to note that although these two years experienced similar community richness, the species composing these communities did differ considerably. For example, of the 100 cumulative species encountered during 2003-2004, 21 species were only detected a single year (i.e. 8 in 2003 and 13 in 2004). Some possible explanations for this may include the considerably different hydrologic conditions between the two years (i.e. American Woodcock, Kentucky Warbler, and Willow Flycatcher), species at or near the edge of their breeding range (i.e. Cattle Egret, Mississippi Kite, and Summer Tanager), and various late spring migratory species (i.e. Olive-sided Flycatcher, Alder Flycatcher, and Blackpoll Warbler).

The early successional habitats in 2004 (i.e. points 1-12 and 49-51) were still in active agricultural production in 1992. As a result, the nearly 700 acres of old field and early successional floodplain forest habitat available in 2003-2004 was almost completely cropland in 1992 (Birkenholz 1992). This increase in habitat diversity may explain the greater avifaunal diversity encountered in 2003 and 2004 as compared to 1992. The field work for Treiterer (1996) was conducted in 1994 and 1995 immediately following the record flood of 1993. The habitat throughout the study area was considerably altered. Ground cover and most of the understory were gone, while canopy tree mortality ranged from 24% to 59% and averaged 39% throughout the study area (Treiterer 1996). Yin et al. (1994) indicated that major floods of prolonged duration cause large-scale disturbances that can substantially change vegetative characteristics within floodplain habitats. These dramatic habitat changes can alter avian communities (Hunter et al. 1987; Knutson and Klaas 1997). Various research has documented declines in avian diversity and abundance during and immediately following major flood events (DeSante and Geupel 1987; Hunter et al. 1987; Knopf and Sedgwick 1987; McKay et al. 1996; Knutson and Klaas 1997). Consequently, this may explain the substantially fewer number of species recorded by Treiterer (1996) as compared to 1992 and 2003-2004. Although the 2004 breeding season experienced a flood event, which was absent in 2003, the inundation was of relatively short duration and therefore only effected the herbaceous ground cover habitat component. As a consequence, there appeared to be little impact to the overall breeding bird community.

Ground nesting and low shrub nesting species tend not to be abundant in floodplain systems, perhaps because of the frequent flooding threat (Birkenholz 1992; Knutson and Klaas 1997). Treiterer (1996) indicated that ground nesters such as the Wood Thrush and Kentucky Warbler were almost completely absent. However, once again, this may have been due to the loss of ground cover vegetation resulting from the 1993 flood. Robinson and McKay (2001) also found very few ground nesting species within the Milan Bottoms study area. However, during the 2003 project, various portions of the Long Island Complex study area had enough elevation

to support substantial ground cover and understory vegetation, whereas the occurrence of high water in 2004 greatly reduced this type of available habitat. Nevertheless, the breeding community each year supported several species of ground and shrub nesters, more typically associated with upland habitats (McKay and Stravers 2003). It is unclear why the 2004 flood did not substantially reduce the ground and scrub/shrub nesting communities. Perhaps the high water occurred after these species had already begun nesting activities.

During our project, a fairly large number of expected species were either not observed or were encountered in smaller than anticipated numbers. The objectives of this project emphasized documenting the breeding bird community within the forest and early successional habitats. As a consequence, our surveys were biased against the more aquatic species. In fact, many of these species were only observed during interpoints (i.e. American White Pelican, Double-crested Cormorant, and Cattle Egret). Once again, this may be the reason why species like the Great Egret and Yellow-crowned Night-Heron were not recorded. Likewise, a single American Coot was identified in 2003 and was not reported in 2004. Similarly, waterfowl and shorebird species occurred in relatively small numbers during each field season. In contrast, the most abundant species in 2004 was the Great Blue Heron. However, the abundance of this species was due to the apparently significant increase in the size of the breeding rookery located on Long Island. The reason for this expansion is unknown.

The Rock Pigeon, House Finch, and House Sparrow, although extremely abundant throughout the Midwest, tend to avoid floodplain habitats. The Eurasian Tree Sparrow appears to prefer the floodplain periphery, while many species, which were present in very low numbers (i.e. Bell's Vireo, Brown Thrasher, Chestnut-sided Warbler, Scarlet Tanager, and Eastern Towhee), tend to prefer upland areas. In fact, several upland species were not encountered in 2003 and/or 2004 including Ovenbird (*Seiurus aurocapillus*), Kentucky Warbler, Summer Tanager, Chipping Sparrow, Field Sparrow, and Orchard Oriole (*Icterus spurius*). In contrast, 2 upland species absent in 2003 (Black-billed Cuckoo and Dickcissel) were encountered in 2004. However, most of these individuals occurred early in the field season before the study area was inundated, and few were found following the high water event. The Long Island Complex study area is at the extreme edge of the breeding range for both the Mississippi Kite and Black-and-white Warbler (National Geographic Society 2002). Therefore, it is not surprising that these species are present in some years and not in others. Although we documented the Red-shouldered Hawk and Willow Flycatcher in 2004, only single individuals of each species were tallied. Again, we feel the habitat may not be quite right for the Willow Flycatcher since neither Birkenholz (1992), Treiterer (1996), nor McKay and Stravers (2003) identified this species. Given the preference of the Red-shouldered Hawk for floodplain periphery habitat, it is not expected to be perennially present at this site. Birkenholz (1992) and McKay and Stravers (2003) also failed to record this species, while Treiterer (1996) only identified it in 1995. This species was encountered within the study area in 2002 (Jon Stravers, pers. comm.).

This, along with other avian survey projects, have demonstrated the diversity and dynamic nature of the breeding season avian community within the floodplain of the Upper Mississippi River (Emlen et al. 1986; Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Knutson et al. 1996; Treiterer 1996; Knutson and Klaas 1997; Robinson and McKay 2001). However, in addition to being diverse, this community also possesses an abundance of birds. We recorded an average of approximately 53 individuals during each 10-minute sample. This was extremely similar to our 2003 results (i.e. 53.8 individuals) (McKay and Stravers 2003). Given that most detections are made during the first 5 minutes (Lynch 1995; Petit et al. 1995), our

results were also similar to McKay et al. (1995) which recorded nearly 45 individuals during each 5-minute sample. Overall, “higher priority” NAM and NTM species accounted for 73% of the total individuals identified (34% and 39%, respectively). Again, this was comparable to McKay and Stravers (2003) which reported 72% of the avian community to be composed of NAM and NTM species (28% and 44%, respectively). The reason for the slight difference between the 2 years is unknown, but was possibly due to random chance. Conversely, McKay et al. (1995) recorded approximately 91% NAM and NTM birds (56% and 35%, respectively). The large increase in the proportion of NAM observed by McKay et al. (1995) was partially due to the fact that many points were located at forest – backwater edges, which resulted in more waterfowl and large numbers of Tree Swallows (*Tachycineta bicolor*) being recorded (i.e. NAM species). Furthermore, this project occurred immediately following the 1993 flood, which resulted in a more open-canopied forest. This permitted groups of more “edge-oriented” NAM birds to be more visible (i.e. American Robin, Song Sparrow, Red-winged Blackbird, and Common Grackle). McKay et al. (1995) and Knutson and Klaas (1997) documented substantial declines in the numbers of RES following a major flood event.

The 2003-2004 Long Island Avian Survey concentrated on sampling primarily the forest and early successional habitats. However, a considerable portion of the forest within the study area experienced substantial tree mortality as a result of the 1993 flood (Yin et al. 1994). As a consequence, much of the forest had large canopy openings and extensively dense secondary growth and ground cover in 2003 (McKay and Stravers 2003). The high water conditions during much of the 2004 breeding season greatly reduced the ground cover component (Appendices B and C). Therefore, in essence, a relatively large amount of the mature closed-canopied forest throughout this study area had been “naturally fragmented.” The same situation had occurred on other studies following 1993 (McKay et al. 1995; Treiterer 1996; Robinson and McKay 2001). By 2003-2004, the canopy openings, which created these “fragments,” now had a secondary canopy of well-established successional growth as well as dense ground cover in 2003 (Appendices B and C). This situation resulted in a greater diversity of successional habitats, which may account for a certain portion of the diversity and abundance of the avian communities both at Long Island during this project and at Milan Bottoms (Robinson and McKay 2001).

However, this increased avian diversity and relative abundance may have some potentially negative impacts. Of the 10 most abundant species, as well as those with the highest relative densities in 2004, 8 were considered to be more typically habitat generalist and/or habitat edge species. These included the Great Blue Heron, Common Grackle, Northern Cardinal, Indigo Bunting, Black-capped Chickadee, American Crow, Red-winged Blackbird, and Chimney Swift (Table 1). Likewise, the most frequently encountered species were largely habitat generalists and/or edge species. Similar results were found at other study sites within the Upper Mississippi River floodplain (McKay et al. 1995; Robinson and McKay 2001). The concern is that greater abundance and density of generalist and edge species may be indicative of lower numbers of habitat specialist and forest interior species within these floodplain forest systems (Robinson et al. 1995; Robinson 1996; Robinson and McKay 2001).

Nevertheless, during this project, several area-sensitive species and species of higher management concern were found to occur in relatively abundant numbers. For example, 13 Cerulean Warblers (among the highest priority NTM species) were recorded at 11% of the points, along with 3 others at interpoints (Table 1). Seven NTM species of high management concern were encountered in relatively large numbers and frequencies (Table 1). For example: Yellow-billed Cuckoo (68 birds; 49% of points), Eastern Wood-Pewee (183 birds; 81% of

points), Acadian Flycatcher (34 birds; 23% of points), Great Crested Flycatcher (194 birds; 80% of points), Yellow-throated Vireo (55 birds; 36% of points), Prothonotary Warbler (120 birds; 50% of points), and Yellow-breasted Chat (13 birds; 8% of points) (Table 1). The area-sensitive Pileated Woodpecker was also relatively abundant (59 birds at 41% of the points), however this represented a substantial decline from 2003 (McKay and Stravers 2003), which is not well understood. The Red-headed Woodpecker population has been in serious decline across its range (Price et al. 1995). However, within this study area, 131 were recorded at 65% of the points (Table 1), which was comparable to McKay and Stravers (2003). The robust populations of these species, encountered within the study area, demonstrate the importance of the Long Island Complex to a “high priority” breeding season avian community. Furthermore, the presence of relatively large amounts of both mature forest and early successional habitats function to support this diverse community. For instance, 16 species (17% of the total community) were found only at early successional points (Tables 2 and 3; Appendix E). Among this group was the Mallard, Hooded Merganser (*Lophodytes cucullatus*), Green Heron, Bald Eagle, Killdeer (*Charadrius vociferus*), Rock Pigeon, Willow Flycatcher, Eastern Phoebe (*Sayornis phoebe*), Eastern Kingbird, Bell’s Vireo, Cliff Swallow (*Petrochelidon pyrrhonota*), Brown Thrasher, Yellow-breasted Chat, Eastern Towhee, Song Sparrow, and Dickcissel. Similarly, 14 species (15% of the total community) were only encountered at forested points (Tables 2 and 3; Appendix E). The species within this group included: Black-crowned Night-Heron (*Nycticorax nycticorax*), Red-shouldered Hawk, Spotted Sandpiper, Great Horned Owl (*Bubo virginianus*), Belted Kingfisher (*Ceryle alcyon*), Acadian Flycatcher, Least Flycatcher (*Empidonax minimus*), Bank Swallow, Barn Swallow, Brown Creeper, Eastern Bluebird (*Sialia sialis*), Blackpoll Warbler, Black-and-white Warbler, and Scarlet Tanager.

Additionally, the brood parasitic Brown-headed Cowbird, which flourishes in fragmented forest and grassland habitats, was also extremely abundant (146 individuals) and occurred in a relatively high density (1.43 per point). This species was also one of the 10 most frequently encountered during the project (70% of all points). Additionally, this was one of the most widely distributed species (47 of 51 locations). Overall the cowbird population, among all parameters examined, were similar in 2003 and 2004 (McKay and Stravers 2003). Brown-headed Cowbirds were much more abundant and widespread at the Long Island Complex than at Milan Bottoms (Robinson and McKay 2001), which may be persistently too wet for them. The “fragmented” forest, including the old-field and early successional forest acreage, along with the higher elevation at Long Island appears to be benefiting cowbirds. The impact of cowbirds on the reproductive success of many avian species, especially NTM, has been well documented (Brittingham and Temple 1983; Temple and Cary 1988; Robinson et al. 1995; Robinson 1996).

During this project, we encountered an impressively diverse NTM community. A total of 42 species (46% of the total avifauna) were composed of NTM. Thompson et al. (1993) classified all Midwestern NTM according to management concern for the population. In this classification system, a species with a mean score  $\geq 4.00$  is of highest management concern (Level 4), those from 3.00 to 3.99 are of high concern (Level 3), 2.00 to 2.99 are of intermediate concern (Level 2), while species with a score below 2.00 are of low management concern (Level 1) (Thompson et al. 1993). Similar to 2003, the Cerulean Warbler was the only “highest management concern” species recorded within the study area (Table 4). However, this represents 25% of all Level 4 species (Thompson et al. 1993). Additionally, the Cerulean Warbler was relatively abundant both years (McKay and Stravers 2003) (Table 4). Certainly, more were recorded in 2003-2004 than in previous studies (Birkenholz 1992; Treiterer 1996).

**Table 4. Status and relative abundance of the Neotropical Migrant community present at the Long Island Complex during the 2004 breeding season.**

Species*,**	Status***	# Ind. Pts.	# Ind. Interpts.	# Ind. Total	% Change Ind. from Pts. 2003>
CRWA	4.29	13	3	16	-7 <sup>^</sup>
MIKI	3.71	5	10	15	+100 <sup>^^</sup>
WOTH	3.57	33	4	37	0
CSWA	3.57	0	1	1	-100 <sup>^^</sup>
PRWA	3.57	120	20	140	-2
DICK	3.57	8	0	8	+100 <sup>^^</sup>
ACFL	3.43	34	5	39	-11
BEVI	3.43	1	0	1	-75 <sup>^</sup>
YBCU	3.29	68	4	72	+3
EWPE	3.29	183	1	184	-17
GCFL	3.29	194	2	196	-31
BBCU	3.14	7	1	8	+100 <sup>^^</sup>
WEVI	3.14	3	1	4	+67 <sup>^</sup>
RBGR	3.14	16	1	17	-43
YTVI	3.00	55	1	56	-10
PUMA	3.00	7	0	7	+86 <sup>^</sup>
YBCH	3.00	13	5	18	+46 <sup>^</sup>
SCTA	3.00	4	0	4	+75 <sup>^</sup>
CHSW	2.86	178	1	179	+20
WIFL	2.86	1	0	1	+100 <sup>^^</sup>
GRCA	2.86	47	0	47	+2
YTWA	2.86	38	7	45	+18
BPWA	2.86	1	0	1	+100 <sup>^^</sup>
AMRE	2.86	120	6	126	-4
INBU	2.86	303	0	303	-2
BAOR	2.86	86	1	87	+3
LEFL	2.71	1	0	1	-50 <sup>^</sup>
RTHU	2.57	31	2	33	+26
WAVI	2.57	54	5	59	-35
BKSW	2.57	4	0	4	+100 <sup>^^</sup>
NOPA	2.57	39	3	42	+21
EAKI	2.43	3	0	3	+67 <sup>^</sup>
BGGN	2.43	107	1	108	-3
BWWA	2.43	1	1	2	+100 <sup>^^</sup>
CLSW	2.29	1	0	1	0 <sup>^</sup>
COYE	2.29	46	0	46	-29
REVI	2.14	129	0	129	-11
NRSW	2.14	15	75	90	+33 <sup>^</sup>
BASW	2.14	1	1	2	-14 <sup>^</sup>

**Table 4. Continued.**

<b>Species*,**</b>	<b>Status***</b>	<b># Ind. Pts.</b>	<b># Ind. Interpts.</b>	<b># Ind. Total</b>	<b>% Change Ind. from Pts. 2003&gt;</b>
HOWR	1.57	124	1	125	+10
YEWA	1.57	25	0	25	-22
SPSA	?	1	1	2	+100^^

\* Species listed in order of management concern (Thompson et al. 1993). Multiple species with identical scores are placed in taxonomic order (American Ornithologists' Union 2003).

\*\* Species codes are found in Appendix D.

\*\*\* Mean score of management concern (Thompson et al. 1993).

> Number of points sampled in 2004 was 6% greater than 2003.

^ Based on less than 25 individuals sampled at points during both 2003 and 2004.

^^ Species was not recorded during 2003.

^^^ Species was only recorded during interpoints in 2004.

? Species not ranked according to management concern (Thompson et al. 1993).

Seventeen species of “high management concern” were documented in 2003 and 2004 (McKay and Stravers 2003) (Table 4). This represents 32% of all Level 3 species (Thompson et al. 1993). Several of these species ranged from fairly to extremely abundant (Table 4), especially the Eastern Wood-Pewee, Great Crested Flycatcher, and Prothonotary Warbler. In 2003, 18 “intermediate management concern” species were recorded (McKay and Stravers 2003), while 21 occurred in 2004 (Table 4). This accounts for 36% and 42%, respectively, of all Level 2 species (Thompson et al. 1993). Once again, many of these species were abundant throughout the study area (Table 4). Species of noteworthy abundance included the Chimney Swift, Red-eyed Vireo, Blue-gray Gnatcatcher, American Redstart, and Indigo Bunting (Table 4). Two of the 3 species of “low management concern” (67% of Level 1 species) were identified in 2004, compared to all 3 Level 1 species (100%) encountered in 2003 (McKay and Stravers 2003) (Table 4). Of these, the House Wren was very abundant both years, the Yellow Warbler (*Dendroica petechia*) was somewhat numerous each year, and the Chipping Sparrow was uncommon in 2003 and absent in 2004 (McKay and Stravers 2003) (Table 4). Additionally, the Spotted Sandpiper, which is not ranked according to management concern, was present within the study area in 2004. Once again, the abundance of the NTM community further demonstrates the overall importance of the Long Island Complex to breeding bird populations.

In conclusion, this project has certainly documented the importance of this particular site to an abundant breeding avian community. Furthermore, we believe it also provides evidence suggesting the importance of the Upper Mississippi River floodplain to a richly diverse and abundant Midwestern avifauna.

## **RECOMMENDATIONS**

### **Habitat Management**

Much of the forested habitat within the Long Island Complex study area consists of “fragments” or “patches” of mature bottomland forest interspersed with areas of younger forest and dense herbaceous growth. This earlier successional growth is found within the forest canopy openings and stands of dead trees resulting from the 1993 flood (Yin et al. 1994). This forest regeneration has created a more diverse habitat. As a consequence, avian diversity is also relatively high. However, this has resulted in relatively abundant populations of habitat generalist and habitat edge species, including nest predators like the American Crow and Common Grackle, and brood parasites like the Brown-headed Cowbird.

Therefore, we recommend “passive” management of the forest habitat, by allowing forest regeneration to continue. In areas where regeneration is not occurring, we suggest planting trees in order to re-establish as much contiguous forest habitat as possible. We believe the best management option within the forested areas is to eventually have a closed-canopied mature forest, which is periodically inundated and altered by flood events. Although this will reduce

habitat heterogeneity, and most likely avian diversity, it will provide a relatively large tract of forest for habitat interior and area-sensitive species (Grettenberger 1991; Birkenholz 1992; McKay et al. 1995; Treiterer 1996; Robinson and McKay 2001). This management option will benefit a multitude of high priority species such as the Red-shouldered Hawk, Pileated Woodpecker, Eastern Wood-Pewee, Acadian Flycatcher, Great Crested Flycatcher, Yellow-throated Vireo, Brown Creeper, Veery (*Catharus fuscescens*), Wood Thrush, Northern Parula, Cerulean Warbler, Black-and-white Warbler, American Redstart, Prothonotary Warbler, Ovenbird, Kentucky Warbler, Scarlet Tanager, and Rose-breasted Grosbeak (Robbins et al. 1989; Grettenberger 1991; Robinson et al. 1995; Knutson et al. 1996; Robinson and McKay 2001).

The approximately 700 acres of prior cropland, which now consists of old field and early successional forest, provides valuable habitat for several high priority scrub/shrub species such as the Black-billed Cuckoo, Willow Flycatcher, White-eyed Vireo (*Vireo griseus*), Bell's Vireo, Chestnut-sided Warbler, Prairie Warbler (*Dendroica discolor*), and Yellow-breasted Chat. Maintaining this acreage in earlier stages of ecological succession will require intensive management (McKay et al. 1995). Additionally, this management option may contribute to the overall fragmentation of the forest habitat at this site (Birkenholz 1992).

Therefore, we recommend allowing this acreage to continue to undergo ecological succession. Eventually, it will contribute an additional 700 acres of forested habitat. According to Birkenholz (1992), the old cropland has some of the highest elevation within the study area. Consequently, forest habitat here may take on some upland characteristics. If so, this would provide critical habitat for several species that prefer drier conditions (i.e. Veery, Wood Thrush, Ovenbird, Kentucky Warbler, and Scarlet Tanager). Also, a tree planting effort could be used to establish some greater forest diversity in these slightly higher and drier areas (i.e. oaks, hickories, pecans, walnuts, and sycamores). In conclusion, we recommend that no timber harvesting be conducted within this study area, since this would fragment an otherwise relatively large forest tract.

### **Future Research**

Given the size of this fairly contiguous floodplain forest tract, we recommend establishing a permanent long-term avian monitoring project here. This would provide an ideal study site for examining and monitoring long-term floodplain forest avian communities. Additionally, as this "fragmented" forest regenerates into a closed-canopied forest, researchers will be able to document the dynamic changes within the avian community. Furthermore, we suggest that future avian research within the Long Island Complex should include migration periods as well as the winter season. Little information is available regarding the importance of the Upper Mississippi River floodplain to avian populations during migrational and wintering seasons (McKay et al. 1995; McKay et al. 1999). Eventually, it will be important to monitor the reproductive success of species breeding within these floodplain habitats (Treiterer 1996; Robinson and McKay 2001).

During future avian surveys, we recommend using a fixed-radius point count method incorporating multiple distance bands. This methodology permits species – habitat relationships to be assessed (Cyr et al. 1995). Additionally, researchers can estimate actual densities, instead of relative densities, for each species over the entire study area and within each habitat type

(Bibby et al. 1992; Ralph et al. 1993; Petit et al. 1995). The only disadvantage of fixed-radius point counts is that they are more labor intensive to conduct and analyze (Bibby et al. 1992).

## **INDIVIDUAL SPECIES ACCOUNTS**

Canada Goose (CAGO) - A total of 44 birds were detected at points and 28 were recorded at interpoints. The CAGO occurred at 8 total points (8%), which included only 2 early successional locations (Points 2 and 51). This produced a relative density of 0.43 per point, an increase of 0.40 from 2003. Consequently, there was a 93% increase in individuals at points from the previous year. The CAGO is a NAM, which is certainly a possible breeder within the study area.

Wood Duck (WODU) - There was an 11% decrease in birds at points in 2004. However, 41 WODU were tallied at points and 35 were counted at interpoints. This species was present at 20 total points (20%), which were distributed over 18 locations. The relative density for the WODU was 0.40 per point. Little change in distribution and relative density was observed between 2003 and 2004. This NAM species is certainly a possible breeder within the Long Island Complex.

Mallard (MALL) - Seven birds were recorded at 3 points (3%), all located in the HREP tree planting site (Points 49-51). Additionally, 3 birds were recorded at interpoints. Consequently, the small sample size resulted in a 71% increase of individuals at points from last year. A slight increase in relative density (0.02 to 0.07 per point) occurred between 2003 and 2004. The MALL (NAM) is definitely a potential breeding species.

Hooded Merganser (HOME) - One individual was encountered at a single point (1%), found within the early successional habitat (Point 8). Also, 3 birds were tallied at interpoint locations. Consequently, the relative density was 0.01 per point. Last year, the HOME was not observed at any point locations. However, 3 birds were recorded at interpoints. This NAM species is a possible breeder within the study area.

Wild Turkey (WITU) - No bird was detected at points and 2 were detected at interpoints. Conversely, a single individual was recorded at 1 point (1%), and 1 was observed at an interpoint in 2003. This species is a RES, and a possible breeder within the study area.

Northern Bobwhite (NOBO) - This species was not observed within the study area in 2004. However, in 2003, 1 bird was recorded at Point 33 (1%), and 1 was encountered at an interpoint location. The NOBO is a RES and may breed within the study area, although this species is much more common in upland habitats.

American White Pelican (AWPE) - Overall, 32 birds were documented at interpoint locations in 2004. No birds were reported at points. This species was not detected during 2003. The AWPE is a NAM species, which is a migrant only, and not considered a possible breeder.

Double-crested Cormorant (DCCO) - Nine individuals were detected at interpoints. This species was not observed at any point location during the two study years. This NAM species is a potential breeder within the study area.

Great Blue Heron (GBHE) - During this project, we identified 371 individuals at points and another 43 at interpoint locations. This represents a 63% increase from 2003. The GBHE was recorded at 43 total points (42%). Overall, this bird was distributed over much of the study area (31 sampling locations). The relative density for this species increased from 1.44 to 3.64 per point between 2003 and 2004, respectively. Consequently, the GBHE was one of the most abundant and relatively dense birds recorded in 2004. A fairly large rookery was present within the study area. Therefore, this NAM species is a confirmed breeder.

Cattle Egret (CAEG) - No individuals were recorded in 2003. However, 2 birds were only recorded at interpoints in 2004. Although Long Island occurs near the edge of the breeding range, the CAEG (NAM) is considered an unlikely breeder.

Green Heron (GRHE) - For the second year in a row, a single individual was recorded at 1 point (1%). Last year this species was identified at early successional Point 7, and this year at the HREP Point 51. Additionally, 2 individuals were recorded at interpoints in 2004. Consequently, the relative density remained the same (0.01 per point). This NAM is a possible breeder within the study area.

Black-crowned Night-Heron (BNHE) - One bird was documented at a single point (1%) (Point 33). This was a similar result to 2003. Therefore, both years maintained a relative density of 0.01 per point. The BNHE is a NAM and considered a potential breeder at this site.

Turkey Vulture (TUVU) - We identified 23 birds at points and 5 at interpoints. This represents an increase of 65% from last year. The TUVU was recorded at 13 total points (13%), and was distributed over a limited portion of the complex (5 survey locations). The relative density of the TUVU was 0.23 per point, an increase of 0.15 per point from 2003. This NAM species is certainly a possible breeder within the Long Island Complex.

Mississippi Kite (MIKI) - Five individuals were recorded at points and 10 at interpoints. No individuals were identified in 2003. The MIKI was documented at 2 points (2%) (Point 40 and 49), producing a relative density of 0.05 per point. The Long Island Complex is located at the extreme northern edge of this NTM range, and it is therefore is a potential breeder. The MIKI is of high management concern (3.71 mean score as determined by Thompson et al. 1993).

Bald Eagle (BAEA) - During this project 2 birds were documented at 2 (2%) early successional points (6 and 11). Additionally, 4 birds were documented at interpoint locations. No BAEA were recorded in 2003. The relative density for this species was 0.02 per point. This NAM species is a potential breeder within the study area.

Cooper's Hawk (COHA) - A total of 3 birds, matching the 2003 total, were identified at 3 points (3%). No individuals were recorded at interpoints. Relative density remained practically the same over the two years at 0.03 per point. This species was distributed among Points 13, 48, and 49. The COHA is a NAM, which potentially breeds at this location.

Red-shouldered Hawk (RSHA) - Only 1 RSHA was tallied at a single forested point (Point 39) (1%). No birds were documented within the study area in 2003. This NAM raptor had a relative density of 0.01 per point. The RSHA is certainly a potential breeding species.

Red-tailed Hawk (RTHA) - Overall, 17 birds were recorded at 11 total points (11%), including 5 at interpoints. The relative density for this raptor was 0.17 per point, which represents an increase of 0.13 from 2003. This species had a very limited distribution last year, occurring at only 2 point locations (Points 2 and 42). However, in 2004, this raptor was distributed among 9 locations. This undoubtedly resulted from a 76% increase in the number of individuals found at points. The RTHA, which is a NAM, is a possible breeding species. Although very adaptable, the RTHA tends to prefer upland habitats.

American Coot (AMCO) - No individuals were recorded within the study area in 2004. One individual was detected at the interpoint during the 2003 breeding season. This is a NAM species, which is a possible breeder within the study area.

Killdeer (KILL) - Five individuals were identified at 2 points (2%). In 2003, 1 KILL was identified at a single point and 13 at interpoints. Points 7 and 49 were the only survey locations where this species was observed in 2004. The KILL showed an 80% increase in the number of individuals recorded in 2004. However, the relative density still remained low at 0.05 per point. This shorebird is a NAM, and a potential breeding species.

Spotted Sandpiper (SPSA) - Only 1 bird was detected at a single point (1%). This species was located at forested survey Point 15. One additional bird was recorded at an interpoint. No individuals were recorded in 2003. The relative density for the SPSA was 0.01 per point. This NTM is a potential breeder within the study area, and was not classified in terms of management concern.

American Woodcock (AMWO) - We identified only 1 bird at an interpoint in 2003. No birds were recorded in 2004. The AMWO is a NAM, which could possibly breed within the study area.

Rock Pigeon (ROPI) - A single individual was recorded at a single point (1%), while none were detected at interpoints. The ROPI was encountered at Point 3. This species was not present within the study area in 2003 and is generally not associated with floodplain habitats. The ROPI had a relative density of 0.01 per point. This RES species could possibly be a breeding bird, but definitely prefers upland areas which are associated with human development.

Mourning Dove (MODO) - This species experienced a 25% decline in the number of individuals at points from 2003. A total of 27 birds were tallied at 18 overall points (18%).

These individuals were encountered among 15 sampling locations. This species had a relative density of 0.26 per point. This NAM species is a possible breeder here. However, MODO tend to prefer more open and upland habitats.

Black-billed Cuckoo (BBCU) - We encountered 7 individuals at 6 total points (6%), and a single bird was observed at an interpoint. Overall, 6 sites accounted for the BBCU observations in 2004, and no birds were documented in 2003. The relative density for this species was 0.07 per point. This NTM is certainly a potential breeding species. The BBCU is a species of high management concern (3.14 mean score based on Thompson et al. 1993).

Yellow-billed Cuckoo (YBCU) - During this project, 68 birds were recorded at points and 4 were tallied at interpoints. Overall, this species was detected at 50 total points (49%). The relative density was therefore 0.67 per point. The YBCU was fairly widely distributed, being identified at 38 of the sampling points. The results from 2003 were relatively the same, except the species was recorded at a total of only 40 points. This species is certainly a potential breeder. The YBCU is a NTM of high management concern (3.29 mean score according to Thompson et al. 1993).

Great Horned Owl (GHOW) - We observed 5 birds at 4 total points (4%). This resulted in a relative density of 0.05 per point. These individuals were encountered at 4 forested points. One additional bird was observed at an interpoint location. A similar number of individuals were reported in 2003. This RES raptor is definitely a potential breeding species.

Barred Owl (BAOW) - A total of 7 birds were recorded at 7 overall points (7%), along with 3 individuals at interpoints. The BAOW was distributed over 7 sampling locations. The relative density for this species was 0.07 per point. The BAOW experienced a 46% decline in the number of individuals at points from 2003, as well as a slight reduction in distribution. This RES species is definitely a possible breeder.

Chimney Swift (CHSW) - We encountered 178 individuals at 65 total points (64%), along with 1 bird at an interpoint. This produced a relative density of 1.75 per point. This species was distributed over most of the study area (46 survey points). A 20% increase in individuals from 2003 resulted in this species becoming one of the most numerous, frequently encountered, relatively dense, and highly distributed birds during the 2004 study. This is certainly a potential breeding species. The CHSW is a NTM of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

Ruby-throated Hummingbird (RTHU) - During the course of this project, 31 birds were observed at 25 total points (25%). Two additional birds were documented at interpoints. This species was distributed over 20 individual survey points. The relative density was 0.30 per point. In 2003, 23 individuals were recorded at 21 total points (22%), resulting in a relative density of 0.24 per point. The RTHU is a possible breeding species. This NTM species is of intermediate management concern (2.57 mean score based on Thompson et al. 1993).

Belted Kingfisher (BEKI) - Four birds were tallied at 4 total points (4%), all within forest habitat (Points 19, 25, 26 and 27). Also, 1 individual was encountered at an interpoint. As a

consequence, the relative density was 0.04 per point. In 2003, only 1 bird was found at a point and 1 at an interpoint. This species is a NAM and a possible breeder.

Red-headed Woodpecker (RHWO) - We identified 131 birds at points and another 5 at interpoints. A slight decline of 8% was shown in the number of individuals at points compared to 2003. In 2004, this species was reported at 66 total points (65%), making it one of the most frequently occurring birds. Additionally, the RHWO was distributed over virtually the entire study area (42 survey locations). The relative density for this species was 1.28 per point as compared to 1.48 in 2003. The RHWO is a NAM species and is definitely a possible breeder.

Red-bellied Woodpecker (RBWO) - During our surveys, 106 RBWO were identified at 62 total points (61%). A substantial decrease (55%) in individuals at points removed the RBWO from the “top ten” list in virtually every parameter from 2003 to 2004. As a result, the relative density dropped from 2.46 per point to 1.04 per point. However, the distribution of this species remained relatively stable (42 sampling locations). The RBWO is a RES and is certainly a possible breeding species.

Downy Woodpecker (DOWO) - A total of 116 individuals occurred at points (37% increase from 2003). Five additional birds were seen at interpoints. Overall, the DOWO was recorded at 60 total points (59%), which was 13 points more than in 2003. This species was widely distributed throughout the study area (42 survey sites). The relative density was 1.14 per point as compared to 0.76 in 2003. The DOWO is a RES, and is also a likely breeding species.

Hairy Woodpecker (HAWO) - We observed 39 birds at 26 total points (25%). Additionally, 3 individuals were encountered at interpoints. This species was distributed among 22 sampling locations, of which all but 2 were in the forested habitat. The relative density of this bird was 0.38 per point. Virtually little population change occurred over the two years of observations. The HAWO is a RES, and certainly a potential breeding species.

Northern Flicker (NOFL) - Overall, 47 individuals were tallied at 29 points (28%), and 2 others were found within interpoints. This resulted in a relative density of 0.46 per point, more than doubling that of 2003. As a result, the NOFL experienced a 57% increase in the number of individuals at points compared to 2003. This species was distributed among almost half of the survey locations (25 points). This is a NAM species, which could possibly breed within the study area.

Pileated Woodpecker (PIWO) - During this project, 59 birds were recorded at 42 total points (41%). Furthermore, 6 others were observed at interpoints. Compared to 2003, the number of PIWO at points declined by 35%. However, this species was found to occur over much of the study area (33 sampling sites). The observed relative density was 0.58 per point compared to 0.95 per point during the previous year. The PIWO is a RES, and a likely breeding species.

Olive-sided Flycatcher (OSFL) - In 2003, 1 individual was detected at the interpoint between Points 3 and 4. This species was not documented within the study area in 2004. The Long Island Complex does not occur within the breeding range of the OSFL. Therefore, this bird is a

migrant only and not considered a possible breeder. The OSFL is a NTM species of high management concern (3.14 mean score as indicated by Thompson et al. 1993).

Eastern Wood-Pewee (EWPE) - As a result of this project, we recorded 183 EWPE at 83 total points (81%). Additionally, 1 bird was recorded at an interpoint. The relative density was a fairly remarkable 1.79 per point. Consequently, for the second year in a row, this species was one of the most abundant, frequently encountered, relatively dense, and widely distributed throughout the study area. However, the EWPE still experienced a 17% decrease in the number of individuals at points compared to 2003. This species occurred over most of the study area (47 survey locations) and is definitely a possible breeder within the study area. The EWPE is a NTM of high management concern (3.29 mean score according to Thompson et al. 1993).

Acadian Flycatcher (ACFL) - We encountered 34 birds at points and another 5 at interpoints. This species was recorded at 23 total points (23%), all of which were in forest habitat. An 11% decline occurred in the number of individuals at points from 2003 to 2004. Consequently, the relative density decreased from 0.40 per point to 0.33 per point. This bird was distributed over 20 separate sampling locations. The ACFL is a possible breeding species. This bird is a NTM of high management concern (3.43 mean score as determined by Thompson et al. 1993).

Alder Flycatcher (ALFL) - This species was not observed within the Long Island Complex in 2004. However, during our 2003 survey, 7 individuals were identified at 5 total points (5%). This study area does not occur within the breeding range of the ALFL. As a result, this species was only a migrant and not considered to be a potential breeder. The ALFL is a NTM species of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Willow Flycatcher (WIFL) - A single bird was recorded at 1 point (1%), which was located within the HREP site (Point 50). The WIFL was not observed in 2003. This species had a relative density of 0.01 per point. This is a NTM, which could possibly breed within the study area. The WIFL is of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Least Flycatcher (LEFL) - One individual was observed at 1 point (1%). The relative density was 0.01 per point. The distribution of this bird was restricted to forested Point 38. In 2003, 2 individual birds were recorded. The study area occurs just outside of the breeding range for this species. Therefore, this is also considered a migrant only, and not a potential breeding species. The LEFL is a NTM of intermediate management concern (2.71 mean score according to Thompson et al. 1993).

Eastern Phoebe (EAPH) - We identified 3 individuals at 3 total points (3%), which were located in the early successional habitat (Points 3 and 11), and the HREP site (Point 51). The relative density for this species was 0.03 per point. Only 2 birds were documented at points in 2003, both in early successional habitat (Point 8). This NAM species is certainly considered a possible breeder.

Great Crested Flycatcher (GCFL) - A total of 194 birds were observed at points, along with 2 at interpoints. This species was detected at 82 total points (80%). Consequently, this bird

sustained a large relative density of 1.90 per point. The GCFL occurred at nearly every sampling location (45 sites). Although the GCFL experienced a 31% decline from 2003, it remained one of the most abundant, frequently encountered, relatively dense, and widespread species throughout the project. This species is a possible breeder within the study area. The GCFL is a high management concern NTM (3.29 mean score as determined by Thompson et al. 1993).

Eastern Kingbird (EAKI) - Three individuals were tallied at 2 total points (2%), occurring only within the HREP area (Points 49 and 50). Therefore, the relative density was 0.03 per point. Only 1 bird was documented at a single point during the 2003 study. This species is a potential breeder within the study area. The EAKI is a NTM of intermediate management concern (2.43 mean score according to Thompson et al. 1993).

White-eyed Vireo (WEVI) - Three birds were observed at 3 total points (3%). A single bird was also encountered at an interpoint. This species was recorded at Points 8, 26, and 51. The resulting relative density was 0.03 per point. Only 1 WEVI was documented at a single point in 2003, as well as 1 individual at an interpoint. This species potentially breeds within the study area. This NTM is of high management concern (3.14 mean score as indicated by Thompson et al. 1993).

Bell's Vireo (BEVI) - Only 1 individual was recorded at a single point (1%). This species was only detected at the early successional Point 3. Four birds were observed at points during the 2003 study. The relative density for this bird was 0.01 per point, a slight decrease from 2003. This species is a possible breeder. The BEVI is a NTM and a species of high management concern (3.43 mean score according to Thompson et al. 1993).

Yellow-throated Vireo (YTVI) - Overall, 55 birds were tallied at 37 total points (36%). Additionally, 1 was recorded at an interpoint. We documented 61 individuals at points in 2003, resulting in a 10% decline in birds between the two study years. Consequently, the relative density of this species also decreased from 0.64 per point (2003) to 0.54 per point (2004). For the second consecutive year, this species was fairly widely distributed over 26 survey locations. The YTVI potentially breeds within the study area, and is a NTM of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Warbling Vireo (WAVI) - We identified 54 WAVI at points, and 5 at interpoints. This species was recorded at 23 total points (23%). The WAVI was distributed among 15 individual sampling locations. This species experienced a 35% decrease in the number of individuals observed, at 13 fewer points compared to 2003. Consequently, there was a 0.33 per point drop in relative density. As a result, the relative density was 0.53 per point during the 2004 study. This is a possible breeding bird. This NTM is a species of intermediate management concern (2.57 mean score as indicated by Thompson et al. 1993).

Red-eyed Vireo (REVI) - During the course of this project, 129 birds were recorded at points. This species was encountered at 64 total points (63%). Although the REVI experienced an 11% decrease in individuals, its frequency of occurrence and distribution remained steady. This species occurred over much of the study area (39 locations). Overall, the relative density declined from 1.51 per point to 1.26 between 2003 and 2004. The REVI is a NTM species,

which possibly breeds within the study area. This is a species of intermediate management concern (2.14 mean score according to Thompson et al. 1993).

Blue Jay (BLJA) - The number of individuals observed at points increased 30% from 2003, totaling 107 birds. This species was identified at 53 total points (52%) in 2004, as compared to 41 total points (43%) in 2003. Consequently, this led to a higher relative density of 1.05 per point in 2004. This species was fairly widely distributed, occurring at 39 individual survey points. The BLJA is a RES species, which is definitely a possible breeder at this site.

American Crow (AMCR) - We identified 206 AMCR at 72 total points (71%). Consequently, a 19% increase in the number of individuals found at points occurred between 2003 and 2004. This increase produced a notable relative density of 2.02 per point. This species occurred at a large proportion of the overall survey points (46 locations). Therefore, this bird was among the most abundant, frequently encountered, relatively dense, and widely distributed species recorded in 2004. The AMCR (RES) is certainly a possible breeder.

Fish Crow (FICR) - We recorded 12 birds at points, and 4 at interpoints. Only 2 FICR were tallied at points during the 2003 study, plus 3 additional birds at interpoints. This bird was observed at 9 total points (9%). The relative density was 0.12 per point, as compared to 0.02 per point in 2003. The FICR was distributed among 8 survey locations. This RES species could possibly breed within the study area.

Purple Martin (PUMA) - We recorded 7 birds at 5 total points (5%), yielding a relative density of 0.07 per point. Only 1 individual was recorded at a point in 2003. The PUMA was reported from 5 sampling locations. This species is a potentially breeding NTM. The PUMA is a species of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Tree Swallow (TRSW) - During this project, 43 TRSW were recorded at 25 total points (25%). Furthermore, 62 birds were observed at interpoints in 2004, whereas only 1 bird was observed at an interpoint in 2003. Additionally, 16 individuals were documented at points during the 2003 survey. As a result, from 2003 to 2004, the TRSW experienced a 63% increase in abundance of individuals at points and a 0.25 per point increase in relative density (0.17 to 0.42). This bird occurred at 21 of the survey points, more than doubling last year's total. This NAM species is definitely a possible breeder.

Northern Rough-winged Swallow (NRSW) - A total of 15 birds were identified at 8 points (8%), along with 75 individuals at interpoints. Interestingly, only 9 NRSW were observed at interpoints in 2003. A 33% increase in individuals at points resulted in a relative density of 0.15 per point. The distribution of this species was limited, as it occurred at only 7 sampling locations. This species possibly breeds within the study area. The NRSW is a NTM species of intermediate management concern (2.14 mean score as indicated by Thompson et al. 1993).

Bank Swallow (BKSW) - No birds were identified during the 2003 project. However, in 2004, 4 individuals were tallied at 3 total points (3%). The BKSW was only seen in the forested habitat (Points 23, 31, and 49). This species had a relative density of 0.04 per point. This NTM

is definitely a possible breeder within the study area and is a species of intermediate management concern (2.57 mean score as determined by Thompson et. al. 1993).

Cliff Swallow (CLSW) - For the second consecutive year, a single individual of this species was detected at 1 point (1%). In 2003, it was located in early successional habitat (Point 10), whereas in 2004, it was observed in the HREP site (Point 49). Consequently, the relative density was 0.01 per point. This NTM species is a potential breeder. The CLSW is a species of intermediate management concern (2.29 mean score according to Thompson et al. 1993).

Barn Swallow (BASW) - Only 1 individual was recorded at a single point (1%), and 1 was observed at an interpoint. This resulted in a relative density of 0.01 per point. The BASW occurred within the forest habitat (Point 30). Conversely, 7 individuals were documented in 2003. Within the study area, this species is a possible breeder. This is a NTM of intermediate management concern (2.14 mean score as determined by Thompson et al. 1993).

Black-capped Chickadee (BCCH) - During this project, 210 birds were encountered at 68 total points (67%). A single bird was recorded at an interpoint. The BCCH experienced a 20% increase in the number of individuals found at points from 2003 to 2004. This created a notable relative density (2.06 per point), which was 0.30 per point higher than in 2003. The distribution remained stable in 2004, virtually covering the entire study area (47 survey locations). As a result, this species remained one of the most numerous, frequently occurring, relatively dense, and widespread in 2004. The BCCH is a RES species, which is certainly a probable breeder.

Tufted Titmouse (TUTI) - We tallied 88 TUTI at points, and 2 individuals at interpoints. This bird was observed at 48 total points (47%). The relative density for this species was 0.86 per point. Although not a tremendously abundant species, the TUTI was widely distributed among 35 survey points. Due to a 17% increase in abundance from 2003, this species increased slightly in every parameter during 2004. This RES is a potential breeder.

White-breasted Nuthatch (WBNU) - We recorded 114 individuals at 59 total points (58%), and 1 additional bird at an interpoint. This resulted in a relative density of 1.12 per point. In 2003, 98 individuals were observed at 51 total points (53%), resulting in a relative density of 1.02 per point. Consequently, the WBNU abundance increased 14% in 2004. This species was again widely distributed throughout the study area (40 sampling locations). The WBNU is a RES species, which is definitely a probable breeder.

Brown Creeper (BRCR) - Twice as many BRCR were observed in 2004 (12 individuals), and were recorded at 12 overall points (12%). Additionally, 1 individual was documented at an interpoint. This species was again only found in the forested habitat (11 sampling sites). The relative density for this species was 0.12 per point, doubling the relative density from 2003. The BRCR is a NAM, which may possibly breed within the study area.

Carolina Wren (CAWR) - Overall, 93 birds were detected at points and 4 were recorded at interpoints. This species occurred at 54 total points (53%). The CAWR was widely distributed throughout the study area, occurring at 35 of the survey locations. This species experienced a

slight increase in abundance (11%) from 2003, which resulted in a slightly higher relative density in 2004 (0.91 per point). This species is a RES, and a possible breeding bird.

House Wren (HOWR) - During this project, 124 individuals were tallied at points, along with 1 at an interpoint. The HOWR was identified at 60 overall points (59%). The number of individuals at points increased by 10% in 2004, compared to 2003. The relative density for this bird was 1.22 per point. This species exhibited a substantial distribution, occurring at 42 sampling locations. This is definitely a likely breeding species. The HOWR (NTM) is a species of low management concern (1.57 mean score as indicated by Thompson et al. 1993).

Blue-gray Gnatcatcher (BGGN) - We encountered 107 birds at 53 total points (52%), along with 1 additional bird found at an interpoint. This resulted in a relative density of 1.05 per point. This species was distributed over much of the study area (35 survey points). Of these, all but three locations were in forested habitat. The BGGN population parameters remained steady between 2003 and 2004. This species is certainly considered a possible breeder. The BGGN is a NTM of intermediate management concern (2.43 mean score according to Thompson et al. 1993).

Eastern Bluebird (EABL) - Only 1 individual was observed at a single point (1%), which was located in the forest habitat (Point 20). Additionally, a single EABL was documented at an interpoint. In 2003, only 1 bird was recorded at a point. Consequently, the relative density remained at 0.01 per point. This species, which is more common in relatively open upland habitats, is a NAM that could potentially breed within the study area.

Wood Thrush (WOTH) - Overall, 33 birds were identified at points, and 4 others were encountered at interpoints. The WOTH was reported at 19 points (19%). Therefore, the relative density for this species was 0.32 per point. Although typically considered to be much more of an upland forest species, the WOTH was distributed throughout 17 sampling points. Virtually no change in population parameters occurred for this species between 2003 and 2004. This is a possible breeding species. The WOTH is a NTM of high management concern (3.57 mean score as determined by Thompson et al. 1993).

American Robin (AMRO) - A 19% decrease in the number of individuals recorded at points occurred in 2004. However, we still documented 157 birds at 65 total points (64%). This species exhibited a decline in relative density from 2.03 per point to 1.54 per point between the 2003 and 2004 seasons. The AMRO was distributed throughout most of the study area (43 survey locations). Overall, this bird was among the most frequently encountered and widely distributed in 2004. This NAM is definitely a probable breeding species at this site.

Gray Catbird (GRCA) - During this study, 47 individuals were encountered at 21 total points (21%). The relative density was 0.46 per point. The GRCA was reported from 12 sampling locations, of which all but 1 was in the early successional habitat. The GRCA experienced very little population change from 2003. This species is a possible breeder, although it is much more common in upland habitats. This NTM is of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Brown Thrasher (BRTH) - Only 1 bird was observed at a single point (1%), located within the early successional habitat (Point 10). The relative density was 0.01 per point. In 2003, 4 individuals were found at 3 early successional locations (Points 3, 5, and 12), plus 1 at an interpoint. This NAM could potentially breed within the study area, but it is far more common in upland shrub/scrub habitat.

European Starling (EUST) - We recorded 21 birds at 11 total points (11%). The resulting relative density was 0.21 per point. Ten fewer birds (32%) were tallied at points in 2004, as compared to 2003. Ten individual survey points yielded this species. Although much more common throughout various upland habitats, this RES species could possibly breed within the study area.

Cedar Waxwing (CEWA) - In 2004, a total of 31 individuals were tallied at 16 overall points (16%), compared to 59 birds at 19 total points (20%) in 2003. Consequently, the CEWA experienced a 47% decline in abundance. The resulting relative density was 0.30 per point. This species was distributed among 13 separate locations. The CEWA is a NAM, which may certainly breed at this site.

Northern Parula (NOPA) - Overall, 39 birds were reported at 29 total points (28%). Additionally, 3 individuals were recorded at interpoints. Although 21 individuals were tallied at interpoints in 2003, 8 fewer birds (21%) were identified at points last year. This resulted in a relative density of 0.38 per point in 2004. The NOPA occurred among 25 survey locations, of which all but two were in forested habitat. In 2003, this species was only distributed among 14 separate points. This is certainly a possible breeding bird within the study area. The NOPA is a NTM species of intermediate management concern (2.57 mean score according to Thompson et al. 1993).

Yellow Warbler (YEWA) - A total of 25 birds were detected at 17 cumulative points (17%). This yielded a relative density of 0.25 per point. The YEWA occurred at 15 distinct locations, the majority of which were early successional sites. This species exhibited a 22% decline in abundance from 2003 to 2004, but occurred at the same number of total points. Although a potential breeding species here, the YEWA is somewhat more common in upland shrub/scrub habitat. This NTM is a species of low management concern (1.57 mean score as determined by Thompson et al. 1993).

Chestnut-sided Warbler (CSWA) - In 2003, one bird was identified at a single point (1%), which was in the early successional habitat (Point 7). However, in 2004, the only bird identified was at an interpoint. Our study area does not occur within the breeding range of the CSWA. Additionally, this species tends to occur more often in upland shrub/scrub habitat. Therefore, this bird is considered to be a migrant only and not a possible breeder. The CSWA is a NTM of high management concern (3.57 mean score as indicated by Thompson et al. 1993).

Yellow-throated Warbler (YTWA) - We recorded 38 birds at 31 overall points (30%), and 7 others at interpoints. The YTWA experienced an 18% increase in abundance in 2004, and was observed at 9 more overall points. As a result, the relative density was 0.37 per point. This species was distributed among 23 separate sampling points, of which all but 1 were located in the

forested habitat. The YTWA is definitely a probable breeder here. This NTM species is one of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

Blackpoll Warbler (BPWA) - This is a new species for 2004. Only one individual was recorded at a single point (1%), yielding a relative density of 0.01 per point. This bird was found within the forest habitat (Point 35). The BPWA was only a migrant and not considered to be a potential breeder. This NTM is of intermediate management concern (2.86 mean score as documented by Thompson et. al. 1993).

Cerulean Warbler (CRWA) - A total of 13 CRWA were observed at 11 cumulative points (11%), along with 3 birds at interpoints. This produced a relative density of 0.13 per point. Overall, the CRWA occurred at 9 individual locations. Of these, all but one was found in forest habitat. This abundance, frequency of occurrence, relative density, and distribution remained similar between 2003 and 2004, and was substantially greater than previously documented (Birkenholz 1992; Treiterer 1996). This species is certainly a potential breeder within the study area. The CRWA is a NTM of highest management concern (4.29 mean score as determined by Thompson et al. 1993).

Black-and-white Warbler (BWWA) - This is also a new species for 2004. One bird was found at a single point (1%) in forested habitat (Point 23), and 1 individual was observed at an interpoint. As a result, the relative density for this species was 0.01 per point. Although near the edge of its breeding range, the BWWA could possibly breed within the study site. This NTM is of intermediate management concern (2.43 mean score according to Thompson et. al. 1993).

American Redstart (AMRE) - During the course of this project, 120 birds were encountered at points and 6 were recorded at interpoints. This species was detected at 49 total points (48%), yielding a relative density of 1.18 per point. The AMRE was fairly widely distributed throughout the study area (32 survey points). Little change occurred in abundance, frequency of occurrence, relative density, and distribution between 2003 and 2004. This is certainly a likely breeding species. The AMRE is a NTM of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Prothonotary Warbler (PRWA) - During this study, we recorded 120 PRWA at 51 total points (50%), as well as 20 birds at interpoints. This produced a notable relative density of 1.18 per point. Although this species was distributed over 4 more sampling locations (32 points) in 2004, its abundance and relative density was similar to 2003. Of these locations, all but one were located in forested habitat. This NTM species is definitely a probable breeder within the study area. The PRWA is a high management concern species (3.57 mean score according to Thompson et al. 1993).

Kentucky Warbler (KEWA) - No KEWA were observed within the Long Island Complex in 2004. However, in 2003, 2 birds were observed at 2 total points (2%), of which both were in forest habitat (Points 34 and 46). Although this species is a possible breeder, KEWA tend to be found much more frequently in upland forests. This is a NTM species of high management concern (3.14 mean score as determined by Thompson et al. 1993).

Common Yellowthroat (COYE) - Overall, 46 individuals were tallied at points in 2004 as compared to 65 birds in 2003. As a result, the COYE experienced a 29% decline in abundance. This bird was encountered at 19 cumulative points (19%) in 2004 and 24 total points (25%) in 2003. The relative density was 0.45 and 0.68 per point in 2004 and 2003, respectively. This species was detected at 12 separate locations, of which all but 1 were in early successional habitat. This is certainly a potential breeding species. The COYE is a NTM of intermediate management concern (2.29 mean score as indicated by Thompson et al. 1993).

Yellow-breasted Chat (YBCH) - Overall, 13 individuals were observed at 8 total points (8%), while 5 were recorded at interpoints. The relative abundance of the YBCH increased by 46% in 2004, resulting in a higher relative density of 0.13 per point compared to 0.07 per point in 2003. This species was identified at 7 individual sites, all of which were early successional. Although the YBCH is a potential breeding bird, this species tends to prefer upland shrub/scrub habitat. This NTM is a high management concern species (3.00 mean score according to Thompson et al. 1993).

Summer Tanager (SUTA) - In 2003, we recorded 1 bird at a single point (1%), which was in forested habitat (Point 18). No individuals were identified within the study area in 2004. This species is a possible breeder within the study area, however it occurs much more commonly in upland woodlands. The SUTA is a NTM species of high management concern (3.00 mean score as determined by Thompson et al. 1993).

Scarlet Tanager (SCTA) - Four birds were recorded at a 4 total points (4%), all of which were found in forest habitat. The relative density was 0.04 per point. This species was distributed among 4 separate sampling locations. Only one individual was recorded at a point during the 2003 survey. This is also a possible breeding species, which is more abundant in upland forests. The SCTA is a NTM species of high management concern (3.00 mean score as indicated by Thompson et al. 1993).

Eastern Towhee (EATO) - In 2004, a single bird was documented at 1 point (1%). In 2003, 3 individuals were detected at 3 total points (3%). The EATO was found in the early successional habitat (Point 8). The resulting relative density was 0.01 per point. This NTM species is definitely a potential breeder, however it is far more common in upland woodlands.

Chipping Sparrow (CHSP) - During the 2003 study, 3 birds were identified at 3 cumulative points (3%). However, in 2004, no CHSP were detected within the study area. Although a possible breeder, this species is considerably more numerous in open upland and shrub/scrub habitats. The CHSP is a NTM of low management concern (1.86 mean score according to Thompson et al. 1993).

Song Sparrow (SOSP) - During the course of this study, 17 birds were encountered at 9 total points (9%). The relative abundance of the SOSP was only half in 2004, yielding a relative density of 0.17 per point. The distribution of this species occurred among 6 separate early successional locations, as compared to 15 sampling locations in 2003. The SOSP is a NTM, which definitely could breed within the study area.

Northern Cardinal (NOCA) - Overall, we recorded 272 individuals at 99 total points (97%). The NOCA experienced a 13% decrease in abundance in 2004. This species was distributed throughout the entire study area, occurring at all 51 sampling points. This represents 1 of only 2 species to occur at all sampling locations. The NOCA had an impressive relative density of 2.67 per point. Consequently, this species once again remained among the most numerous, frequently encountered, relatively dense, and highly distributed throughout the study area. The NOCA is a RES species, which is very likely a breeder within the study area.

Rose-breasted Grosbeak (RBGR) - A total of 16 RBGR were identified at points, along with 1 at an interpoint. This species was encountered at 12 cumulative points (12%). A 43% drop in abundance from 2003, resulted in a relative density of 0.16 per point in 2004. The distribution of this species occurred among 10 separate sampling locations, of which all but 1 were in early successional habitat. Although certainly a possible breeder, the RBGR tends to occur more frequently in upland habitats. This is a NTM species of high management concern (3.14 mean score as determined by Thompson et al. 1993).

Indigo Bunting (INBU) - During this project, a total of 303 individuals were recorded at 99 overall points (97%). The abundance of this species was similar between 2003 and 2004. The INBU also had a substantially large relative density of 2.97 per point. As with the NOCA, this species was also distributed among all 51 sampling locations. Therefore, for the second consecutive year, this was one of the most abundant, frequently encountered, relatively dense, and widespread species throughout the study area. The INBU is most likely a breeding bird here. This NTM is of intermediate management concern (2.86 mean score as indicated by Thompson et al. 1993).

Dickcissel (DICK) - The DICK is a new species for 2004. Eight birds were recorded among 3 total points (3%), all located within the HREP site (Points 49, 50, and 51). As a result, the relative density was 0.08 per point. This species is a possible breeder within the study area, however it occurs much more commonly in upland grassland habitats. The DICK is a NTM species of high management concern (3.57 mean score as determined by Thompson et al. 1993).

Red-winged Blackbird (RWBL) - We encountered 196 birds at 38 total points (37%). A 19% increase in the number of individuals from 2003, produced a noteworthy relative density of 1.92 per point during 2004. As a consequence, this species was one of the most relatively abundant and dense during the 2004 breeding season. However, the RWBL only occurred among 25 different survey points. The RWBL is a NAM, which most likely is a breeder within the study area.

Common Grackle (COGR) - A total of 370 COGR were identified at 80 total points (78%), along with 1 recorded at an interpoint. This produced a substantially large relative density of 3.63 per point. In 2003, 315 individuals were documented at 68 total points (71%). Again, the COGR occurred over virtually the entire study area (48 survey locations). Therefore, for the second consecutive year, this was one of the most abundant, frequently occurring, relatively dense, and widely distributed species. This NAM is most definitely a potential breeding species at this site.

Brown-headed Cowbird (BHCO) - We encountered 146 birds at 71 total points (70%), along with 4 birds at interpoints. No change in relative abundance occurred between 2003 and 2004. The relative density was a notable 1.43 per point. This was also a widely distributed species, occurring among 47 distinct locations. This NAM is a possible breeder. Although one of the most frequently encountered and widespread species throughout the study area, the BHCO tends to prefer highly fragmented upland habitats.

Baltimore Oriole (BAOR) - Overall, 86 individuals were detected at 51 cumulative points (50%), along with a single bird at an interpoint. This yielded a relative density of 0.84 per point, which was nearly the same as in 2003. Overall, only 3% more birds were identified at points in 2004. This species was again fairly widely distributed throughout the study area (36 sampling locations). The BAOR is certainly a potential breeding species. This is a NTM of intermediate management concern (2.86 mean score according to Thompson et al. 1993).

American Goldfinch (AMGO) - During this project, 123 birds were recorded at 61 total points (60%), including 1 individual found at an interpoint. The AMGO experienced a 15% increase in relative abundance during 2004, yielding a relative density of 1.21 per point. By comparison, the relative density in 2003 was 1.09 per point. The AMGO was widely distributed over a substantial portion of the study area (41 survey points). This NAM is certainly a possible breeder, although the species prefers more upland habitats.

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